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The Automobile Engineerig Students' Association

MAGAZINE

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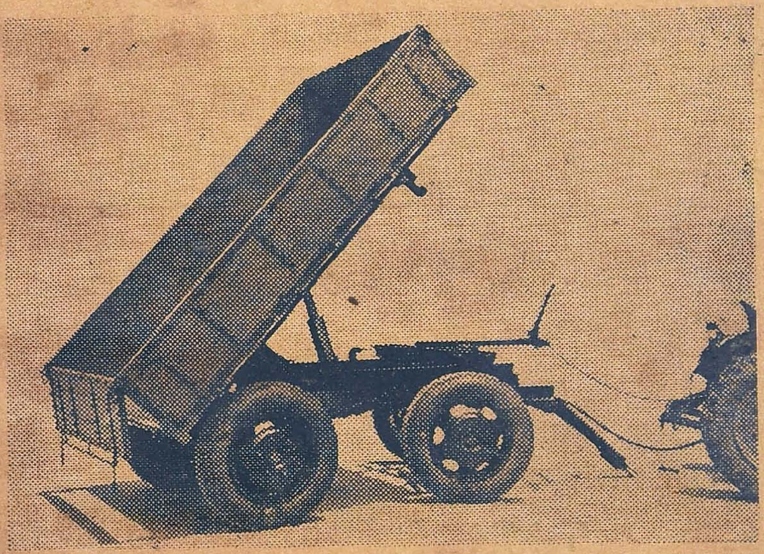

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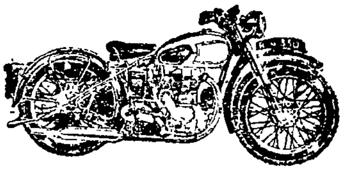

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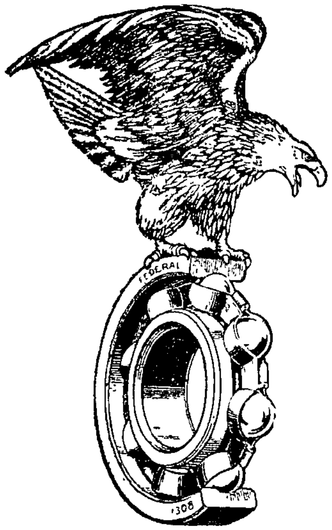

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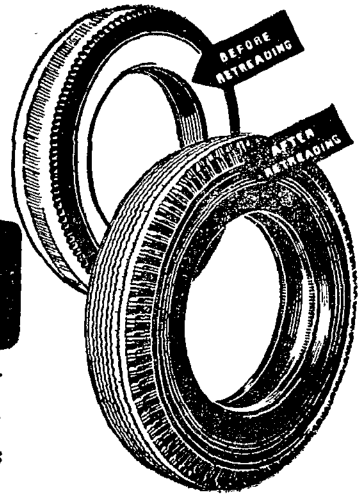

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Our Motherland, Free India must become great industrially to find food, accommodation and other necessaries for the children of the soil. That was one of the dreams of Swami Vivekananda, the patriot saint of India. We must utilise the latest inventions of Science for our economic uplift. That transport plays a very important part in this venture is clear to all. The Automobile Engineering Students' Association Magazine is serving our general readers also by carrying some knowledge of the elementary principles of Transport to the doors of all. May the Almighty bless this useful endeavour of the Technical Institute of the Mission and may all profit by its perusal.

Swami Kailashananda
President

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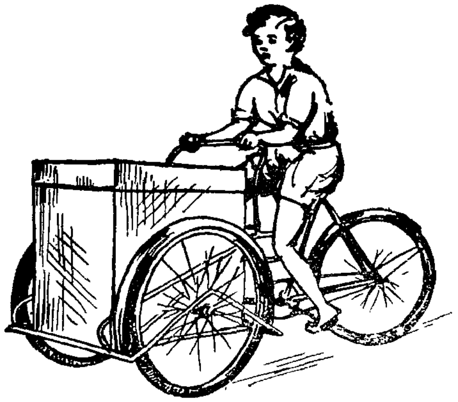

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MAGAZINE
The Ramakrishna Mission Technical Institute

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Vol. VII 1954

Editorial

This year marks the seventh year of the useful career of this magazine.

The first attempt by students to bring out a magazine was made in the year 1947—48. That year a manuscript magazine was published. The very next year the students, with the help of some firms by way of advertisements, were able to publish a printed issue. Since then, it has been developing step by step and providing much opportunity to the members to develop their writing talents. We hope to make more progress in the future.

During this year India lost one of her illustrious sons in the passing away of Sri Alladi Krishnaswami Iyer. He was the Vice-president of the Managing Committee of our Home and so, much more the loss to us. He was a fine example to young poor students showing to what great heights one can rise by constant, hard and sincere work. We place on record our deep sorrow for this great loss and pray that his soul may rest in peace.

Another loss to the Automobile Industry was the sad death of Sri Raghunandana Saran, (Director of Messrs. Ashck Motors, Ennore) in the recent air-crash. A great industrialist is lost for ever. He was not only an industrialist but was also connected with our freedom struggle. May his soul rest in peace!

Government of India have been awarding for the past three years a stipend of Rs. 75/- per month to a student of our Institute, who stood first in the Diploma Examinations, tenable for two years to enable him to acquire advanced practical training. They have temporarily suspended the scheme and are thinking of instituting the scholarship in the training establishment itself. It would be better if the original system of instituting this stipendiary scheme in the educational institution is continued.

India has made good progress in the execution of Five-Year plan. It is gratifying to note that she has completed two major schemes in this part of the

country, viz. the Tungabadra and the Bhavanisagar projects during this year. We are proud that several of our students are associated with these schemes which have come to fruition.

It is understood that Messrs. Mercedes Benz are carrying negotiations to start manufacturing of Diesel trucks at Jamshedpur in collaboration with Messrs. Tatas. It will be observed that the use of Diesel engines for transport and other purposes in this country is increasing day by day and representatives of many foreign firms are visiting India and are exploring the possibilities of starting manufacture of diesel vehicles with the material and labour available locally. One such is the visit of Mr. F. Perkins to Madras with the view of starting manufacture of Perkins diesel engines with their associates in Madras—Messrs. Simpsons.

Already the motor car assembly plants have started making progress in the execution of their programme for gradual manufacture of complete automobile. The progress though in the right direction ts not spectacular. It is not so easy to manufacture all the components which run to thousands under our roof. It will therefore be necessary that a beginning should be made in the manufacture of the various parts of the running gears, chassis, engine etc. and ultimately the complete automobile. For this a co-ordinated plan between limited number of automobile manufacturers is necessary. If each manufacturer attempts to make all the components of a motor car, capital resources are wasted. Taking cylinder-block or say gear box for example, if one firm specialises in this and supply to the other manufacturers to prescribed specifications, it will save a lot of capital and also will facilitate research to be done in their line. This will be the most economical pattern for car manufacturers as each one need not invest large capital for each item. This will also enable concentrated attention to be given to improve the product and reduce cost. Experiments should also be made to use the materials available locally instead of running in the orthodox grooves

If the two former proposals are executed quickly and the Assemblers reach their final goal soon, it will go a long way not only to meet the transport needs of the moving millions of our country but also will greatly encourage the coming into existance of many ancillary industries and thus play a vital role in the industrialisation of India.

It is gratifying to note that many of our students are already doing a grand job in these manufacturing and assembling firms and we are proud that we are contributing, in our own small measure, not only to this great national demand of improved road transport but also in other spheres. The type of training given is so comprehensive that our students are adopting and acquitting themselves creditably in other allied fields also, the training being broad-based that it covers all essentials of mechanical engineering with specialisation in Automobiles. Thus the training given fits in our students well both in mechanical and automobile fields.

Mr. S. Anantharamakrishnan, Managing Director of M/s. Simpson & Co., the leading firm dealing with automoblies has very kindly joined the Managing Committee as one of its members and we look to efficient lead and guidance from him.

This year, we were honoured by the visit of His Excellency the Governor of Madras to our Institue and the Home on 8--8—1953. He evinced great interest in the working of the Institute and went round the various sections in detail. He was much impressed by the training given to the stundents here and also by the interest the students are taking in their work.

A prize of the value of Rs. 10/- was announced this year for the best article written by students. The prize goes to M. Srinivasan and T. Balasubramanian who have written the articles "Rly. Workshop at Perambur" and "Timber".

Content with the small progress we have made in our activities during this year and yet hoping for a good progress in future, we dedicate this issue of our magazine to the lotus feet of Sri Guru Maharaj, who is the source of inspiration to all the Ramakrishna Mission Institutions.

We thank all those who took a keen interest in the successful publication of this issue, to the advertisers and others.

May Sri Guru Maharaj bless us all!

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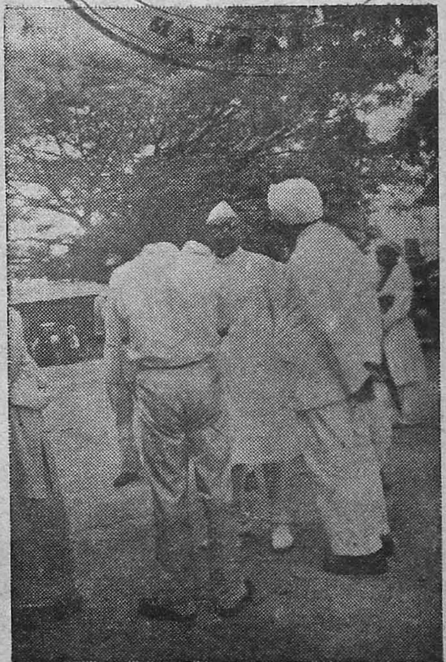
His Excellency, the Governer
Shri Sri Prakasa



A chat with our Director

Transport in Nations' Economy

MR. L. VENKATAKRISHNA IYER, B.A., B.E., M.Ae., S.I., M.M.E.A. (Ind.) I.S.E.,
Chief Engineer, P. W. D., Andhra State.

In the early days when villages were few and scattered, transportation was confined to the limits of a village or between neighbouring villages. Roads were very few and even carts could rarely go from village to village without enormous delay or damage to property.

As things advanced and tracks between villages improved, congregation in places where living was more confortable became common and townships began to develop. These became the centres for transfer of goods by barter or otherwise. Need for better road came to be felt. Roads took considerable time to develop from muddy to macadam-based and what is now termed macadamised, or hard-surfaced roads came into being. Tranport thus became easier but was still slow.

The introduction of rubber tyre and ball bearings accelerated the movements of the traffic and reduced damage. But the cart-bull or the draft-horse could not keep pace with the development of traffic. While the rubber tyres, particularly the pneumatic tyres and ball bearings set up a new record in easy transportation, the tractive effort of the bull or the horse was far too inadequate to fully utilise this advantage. Steam power was already being used in agricultural traction. The introduction of the rubber tyre made it possible to apply this power to road traction. The steam vehicle in due time was found to be too heavy and cumbersome and was followed by the modern light weight "Internal combustion engines". The discovery of petrol made the light weight high speed engines possible. As petrol became scarce, high-speed diesel engines have now come to take its place.

Propulsion engines are now usually driven by petrol, gas or light Diesel oils. Each unit has different characteristics. The one produced a very clean engine with an enormous amount of pick-up. The second is cheaper but less clean and sometimes messy and hard on the engines. The third is a compromise which is both cheap and tidy and has now come to stay. So the modern Transport vehicle is now commonly run with Diesel engines, while lighter passenger vehicles running at high speeds still run on petrol.

The introduction of these fast vehicles required improvements in the road-surface. The old-time macadam road broke down very rapidly with the stress of the traffic and became a mass of pot-holes, severe on the engines and the running gear alike, and the life of the vehicles was short. The introduction of the tar-matress—otherwise called the tarmack or bituman surface—improved the situation a very great deal but the life of such a surface was limited. We are now having the concrete roads which provide the necessary hard surface, absence of dust, long life and ultimately cheapness all round.

Owing, no doubt, to financial reasons we are still far from having reached our optimum development of transport facilities. We have a large headway to

make if transport is to flow more easily and reach adequacy. It is only limited by conditions of finance. In this country, however, difficulty of maintaining vehicles and the difficulty of obtaining spares are added handicaps. To diminish this, it is necessary that we must have a self-contained industry developed in this country of adequate size to meet our transport needs. Our optimum requirement is a motor industry and we are making a slow headway in its production.

It is the ideal of the Ramakrishna Mission Technical Institute to train boys to improve this productivity and it is the duty of every one, Management, Director, staff of the institution and every student to feel his share in this National Uplift and do his best to bring out such an industry.

Facts about "Vijay", the Half-Decker

MR. S. JAGANNATHAN, L.A.E.,
Principal, Ramakrishna Mission Technical Institute.

"What am I", interrogated the Quiz Master of the All India Radio, Madras, the other night, "I am found only in Madras City", he added. A volley of answers followed, to all of which "No" said the Master. Then sudden came a repartee from a bright student, "The Half Decker"! "Correct", a full mark for that to your college" quickly anounced the Quiz Master amidst thundering applause; and the listeners smiled.

Madras City is justly proud of this unique bus. In our welcome address to Dr. U. Krishna Rao, the Minister for Transport, Madras, who presided over a meeting of the inauguration of our Students' Association on 28th July 1953 we have already congratulated the Transport Department, Madras, for the production of this half decker.

ITS GENESIS

Necessity has always been the mother of all inventions in the world. So it is with the birth of the half-decker. It is interesting to trace its genesis. A Double Decker was brought to Madras for demonstration and trial. Hundreds of the avenue trees had to be chopped off, and in many places not only the sagging overhead tram cables but also the low-slung crossing and criss-crossing electric and telephone wires were too low and unless they were raised there was the possible danger of jumping electric spark.

There was a proposal, however, to try it in some of the city roads. But Sri C. Rajagopalachariar, the Chief Minister whose approval was sought for this, totally knocked out the idea and observed that he would not like a single branch of the avenue trees to be cut. While rejecting it sternly Sri Rajaji characteristically gave constructive ideas and asked the officers to devise a bus not so high as that, but which can accommodate more sitting passengers than the normal single decker.

But it was really astonishing how within a couple of months after the above incident, the Half Decker was born. Our enquiry goes to show that the idea to build one like that was in the offing already at the Government Coach Building Factory, Chromepet; but Sri Rajaji's rejection of the Double Decker and his remarks were eye-opener and gave the real fillip and impetus to the genesis of the Half Decker. Not a little credit goes to Sri P. C. Mathew, I.C.S., the Transport Commissioner for the initiation of the novel idea of and keen interest in and encouragement of the bold venture by Sri S. Sundaresan, the Works Manager of the factory. The ideas were cracking the brains of the Works Manager, and his Team of supervisory staff and workers, some of whom, we are proud to state, are products of the Ramakrishna Students' Home. Sri V. R. Meenakshisundaram, L.A.E. an alumnus of the Home, was his then Technical Assistant. We learn that Sri J. Kore, Engineer of the Hindustan Aircraft Ltd., ably assisted in erecting the shell of the all-metal body. The Works Manager with his band of staff and workers have, after a series of trials and experimentation in the unique arrangement for the gangway, the seat frames and windows, brought forth the half decker into being within an incredibly short time after the intuitive observations of Sri Rajaji. They deserve great appreciation for the singular advancement in passenger coach design never thought of before by any operators in any City in India.

The half decker was first inspected and approved by Dr. U. Krishna Rao, the Transport Minister and then it had the blessings of His Excellency Sri Sri Prakasa, the Governor of Madras. It was inspected and inaugurated by Sri Rajaji on 9th May 1953. Pleased with the design he gave the Namakaranam "VIJAY" after the name of the new Tamil Year in which it was born. (See picture when Sri Rajaji christened it). "Vijay" means victory and we see the trimphant and popular bus majestically, roaring like a lion along the City roads, attracting large crowds and awaited for its arrival by long queues of passengers wherever it is operated.

So far about the birth and evolution of Vijay, we may now refer to its special features and technical details.—What is a half decker? Why is it so called? What are the constructional achievements of this Vijay? We discussed these aspects with Sri S. Sundaresan and wish to record an abstract of his views and claims.

FEATURE OF VIJAY

A 'single decker' may be explained as a passenger vehicle, having a single deck which has no part of deck or gangway vertically above another deck or gangway. A 'Double Decker' has two decks one of which is wholly or partly above the other and each deck has its own gangway. A 'Half Decker' is neither a single decker nor a double decker; in some respects it is a single decker and in some other respects it is a double decker. It has neither a single deck alone nor has it double decks i.e. no deck over another. It has neither a single gangway alone nor has it two gangways. The Vijay for outward appearance seems to be a double decker

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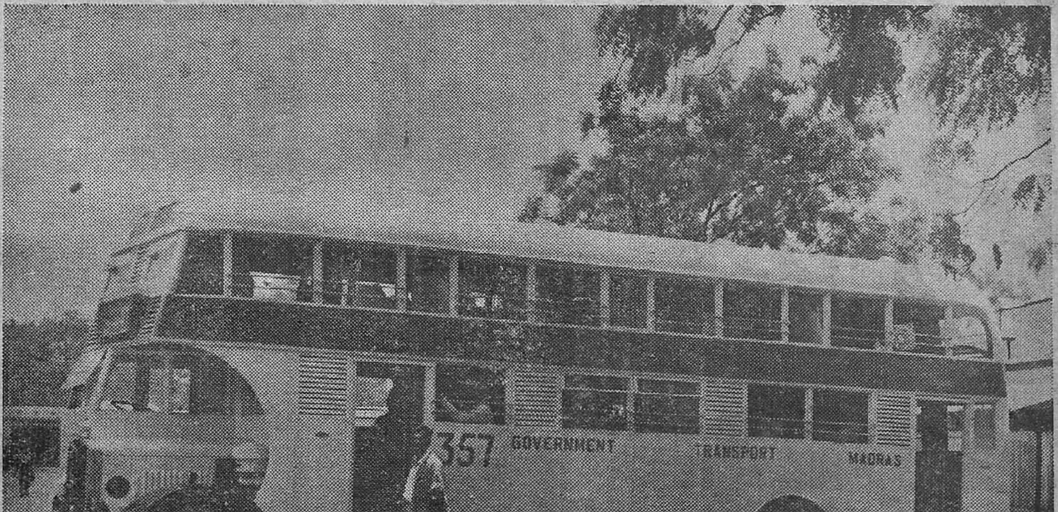
Dr. U. KRISHNA RAO
Hon'ble Minister for Transport



"VIJAY" The Half-Decker.

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RAJAJI
Christening the Half-Decker.

MR. P. C. MATHEW, I.C.S.
Transport Commissioner.

MR. S. SUNDARESAN
Works Manager,
Govt. Coach Building Factory.

but when once we get into it, it is surprising to find only one deck and single main gangway but comfortable facing pairs of seats are arranged in two levels and for each level there are corresponding windows for the facing pairs of seats. The windows are one over the other, but are staggered. It has only one main floor and only one roof unlike the Double Decker in which we see two floors and two roofs. The intermediary roof for lower deck which forms floor for upper deck is entirely eliminated and consequently the flights of steps or spiral stair case located at the rear end of double decker is also eliminated. The central aisle or gangway is raised about 18" from the floor level and from that a passenger can very easily get down to the lower row of seats or get up on the upper row of seats. Either to go up or down there is only one step from the broad aisle. The substantial achievement in this design is that though the overall height is reduced by about 3½ feet from that of the double decker, it does provide sitting accommodation for the same number of passengers, if not more than the latter. The Vijay has seating capacity for 60 passengers. The height of Vijay is only 12 feet as against the height of 15 feet 6 inches of a normal double decker. The maximum permissible height of a single decker, as per rules is 11 feet and the half decker is only a foot taller than this maximum. The maximum permissible height of double decker is 16' and the normal height is 15 to 15½ feet.

Technical data and brief specifications of the chassis and body are given underneath for study.

The outstanding features in the design and construction claimed for the Vijay which may entitle her to superiority over both the single decker and double decker are summarised and set out below:

1. Avoidance of waste of space and reduction in height.

The main feature in the construction is the avoidance of wastage of vacant space—which exist in the double decker and even in single decker. Look at the vacant space above the seated passengers in these vehicles, and compare the head room in cars. Is there no comfortable sitting space in pleasure cars? What is the head room available in the cars? It is only about 6" to 9" above the head of sitting passengers. While so, why should so much of space be wasted in buses over the head of sitting passengers? In the Vijay type such wastage of space of about 3' of the height is eliminated. But the wonder is at the same time the head room for passengers whenever they stand or move about is 30% more than even in a single decker. The elimination of the intermediary roof and floor stanchions and the staircase of double decker are remarkable achievements in the half decker.

2. Reduction in Tare or Unladen Weight.

The reduction in height, of course, means reduction in the weight, for the reduction of 3 ft. of body or about 30% of the total body structure is not the only reduction in tare weight. There is no weight involved for intermediary flooring or roofing staircase and stanchions which are necessary in a double decker.

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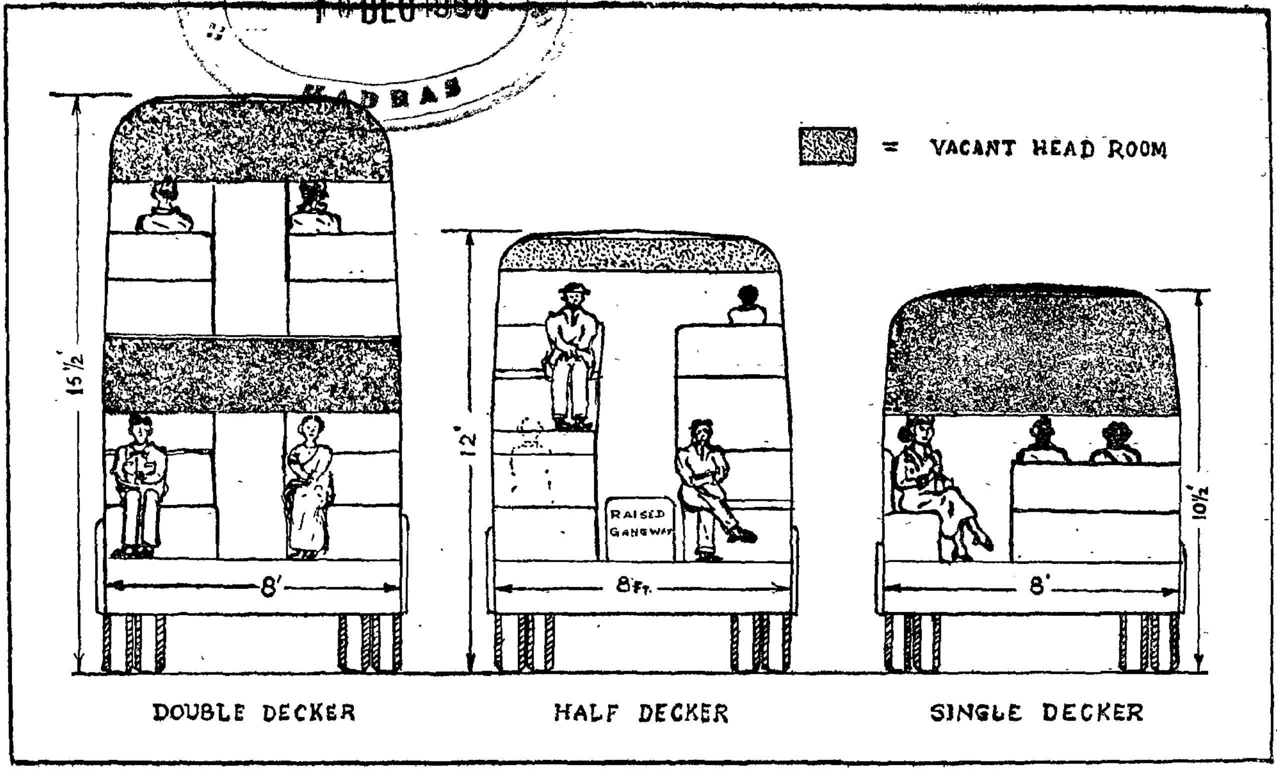

3. Lesser Resistance to Wind.

Because of the reduction in the height of body, wind resistance is considerably reduced by about 33⅓% than that offered by a double decker.

4. Reduction in Wear and Tear.

By reason of (2) and (3) the wear and tear of tyres engine and transmission parts, load on chassis parts and road springs are minimised in the half decker.

5. Increase in Miles per Gallon of Fuel.

Consequent on the above it follows that there is definitely increased mileage per gallon of fuel when compared to double decker. It is practically the same as that of a single decker.

6. Lesser Cost in Body Construction.

Due to avoidance of staircase and intermediary flooring and roofing and due to reduction in height of body and lesser painting area, there is considerable saving in cost of construction, cost of repairs and maintenance when compared to double decker. The only extra height over the single decker is the second row of windows and extra seats.

7. Greater Safety.

It can naturally stand more acute tilting tests, than that of a double decker. It is sturdier and there is more safety on roads. There is no tendency to sway forward and backward or sideways as it is usually found in double decker in respect of the top deck.

8. Absence of Thrust on Side Pillars.

In the double decker, the intermediary roof and floor and all the seat rails in both the berths are resting on the side pillars, thrusting out the side pillars

when loaded with passengers and adding to the stress and strain on cross bearer ends and joints. But the integrally built upper and lower seat frames of the Vijay are resting securely on floor totally avoiding side thrusts on pillars, on panels or cross bearers. This is a distinct achievement and added safety factor when compared to the double decker.

9. Elimination of Dual Conductors.

A single conductor can easily manage a half decker and it is not possible to do so in a double decker.

10. Greater Ease and Safety in Driving.

The driver experiences greater ease and safety in driving and manoeuvring a half decker than the gigantic double decker.

11. Can Ply on Suburban and Mofussil Roads.

As the maximum height is only 12', it is possible to run in suburban and even in mofussil routes, if necessary. Large excursion parties can be taken with comfort and convenience.

12. Ventilation.

The ventilators are a speciality in the Vijay. The passengers experience free flow of wind from the front, from the sides, from above and below and through louvered ventilators and windscreen. There is ventilation for the leg-space both for lower seats and upper seats.

In the double decker the intermediary roof-cum-floor is a great disadvantage affecting ventilation as air circulation from the upper deck to lower deck is completely blocked by it. Its elimination is an excellent feature for the half decker. The window shutters are specially designed and for the first time invented. Some of them are novel type of foldable venetian sutters made out of plastic sheets. They answer all the requirements and afford maximum protection from sun and rain. The side shutters even when in closed position throw light and air for the passengers and there is remarkable visibility for all the passengers as well as the driver. They also add to the elegance and dignified appearance of the Vijay.

It will be seen that the height of the half decker is only about a foot more than a single decker, but the accommodation is increased by 30%. The increased accommodation for sitting, the greater ventilation, light and visibility, the compactness of the enclosed coupe type face to face seats for small parties affording sociability for groups, the convenience and privacy for women, the ease and delight in getting up the easy steps for top tiers of seats ; facility for movements are some of the salient reasons for the undoubted popularity of the half decker and the consequent increase in earning per mile.

People feared that the top seats may hit against the head. Do we hit against the roof in cars or carts ? Do we hit against the bottom of upper berths in railway carriages, while sitting in lower berths ? No ! The same is applicable to half decker. In the Vijay, even if you make a deliberate attempt to hit while getting up you may fail to get a hit on your head !

Vijay is only the first attempt of half decker in our country. Many improvements can be thought of and introduced in future. It is learnt there have been enquiries from other parts of India. There is no reason why the Vijay type

should not be adopted and developed in other metropolitan cities eliminating the ugly and gigantic double deckers and adding to the comfort and safety of passengers.

The design of seating arrangements will be suitable for trams and trains for providing 30% increased accommodation. One wonders why even in hotels with limited accommodation such peculiar seating arrangement cannot be thought of!

"Vijay" has really conquered and earned the love of the travelling public of Madras, and while congratulating the Government Transport Department on this achievement, *Par Excellence,* we commend the introduction of some more half deckers to ease the traffic congestion in the City.

Brief Specifications

Chassis : Guy Arab, 221" W.B. fitted with Gardner 5 L.W. Series Engine.
Tyres : 6/11·00 x 20 — all round
Registesed Laden Weight — 27000 lbs.
Unladen Weight — 18000 lbs.

Structures : All metal frame structure out of body kits manufactured by Hindustan Aircraft Ltd., Bangalore, Chromemolybdenem sections bolted together and welded where necessary and panelled with aluminium sheets.

Body : Measurements : Overall length 30′
Overall width 8′-1″
Overall height 12′
Total internal height — 9′
From gangway — 7′-6″

Seating Capacity : 60 passengers (excluding driver)
Lower Tiers — 30 seats
Upper Tiers — 30 seats

Type of seats : 24 twin seater face to face. 2 six seaters (one in front up and one in rear down).

Size of twin seats : 16″ x 33″.

Upholstery : Latex Foam Rubber Cushions padded with green P. V. C. cloth.

Seat Frames : All tubular with plated top rails.

Height of central aisle from floor — 18″

Width of central axle — 20″

Height of upper seats from the aisle — 18″

Depth of steps — 9″ each.

Reserved women compartment — To seat 8 at the rear. (provided with hat rack and mirror).

Floor : Teak covered with linolium.

Roof : Interior panelled by hardboard.

Windows : Lower row — 5 near side, 7 off side
Upper row — 11 „ 11 „
Shutters :—Special type, newly invented foldable shutters providing light and ventilation and fixed plastic venetian shutters specially designed for small bays.

Ventilators : Louvered ventilators in front and sides and through windscreen gaps.

Illumination : 10 lamps illuminating each set of seat compartment.

Route Board : Ecko-winding gears.

Painting : Exterior — Ivory cream with sash strip of Post office Red in the middle.
Interior — Egg shell matt finish for the roof and larch green upto waist height.

Miscellaneous : Special trafficator, rectangular ball and socket type R. V. mirror, plated front and rear bumpers, "stop", light, plated entrance commode rails and roof grab rails, first aid box, tool box and used ticket box, fire-extinguisher fitted.

Courtesy Begets Courtesy

Mr. J. A. DEVASAHAYAM, M.A., Dip. Auto. Eng.,
Secretary, Automobile Association of Southern India, Madras-2.

Most citizens on the road are more aware of their rights than of their responsibilities. They are keenly alive to their privileges while they forget their duties.

Most accidents on the road are avoidable, and are due to pedestrians who leisurely stroll on the road or walk across it giving no indication of their intention to the hurrying motorists. Drivers of vehicles try to avoid them, but are not successful always. Injured limbs and sudden deaths are the result. Sometimes, drivers in trying to avoid pedestrians run into other persons or objects resulting in more injuries.

The pullers of hand carts who drag heavily laden carts deserve our pity. However, their behaviour in keeping to the centre of the road does not evoke any sympathy. The drivers of motor vehicles are compelled to pass these vehicles on the left side, although according to rules overtaking should be done on the right side.

Pedal cyclists moving on two wheels cannot stop without dismounting. However, mounting a pedal cycle is an easy matter, and cyclists should get down from their vehicles when they are stopped at a road junction. Their meanderings on two wheels at the centre of the road give rise to great risks. If the boys will co-operate with the rest of the traffic, there will be great sympathy for them.

Motorists also are not free from blame. They are in a hurry. They should remember that the time saved in travelling a distance of 5 miles at 30 miles an hour differs only by 2 minutes from the time taken at 25 miles an hour. Motorists should be ready to sacrifice a few minutes of their time for the sake of safety to fellow men.

If all road users will try to understand a little the difficulties of others, there will be a great deal of good will among them. *Courtesy Begets Courtesy* on the road too. It is the only way to eliminate accidents.

U. S. A.—The Largest Nation on Wheels

United States Information Service, 158, Mount Road, Madras 2.

The U. S. automobile industry in its more than 55 years of existence has produced more cars and trucks than any other country in the world. Well over one hundred million motor vehicles have been produced as against the approximate 25 million of all other nations put together.

All over the world the motor vehicle has become a symbol of the wide gap between living standards of the average American family and families in other lands.

In war and peace the automobile has fulfilled a primary role in the lives of American people. 1950 was the greatest peacetime production year of cars and trucks. Since then shifts in the cold war and communist aggression in Korea have necessitated switching some production to military essentials. In spite of this, America is still the largest nation on whels.

In 1952 the business of making, selling, servicing and driving motor vehicles gave work to nearly 10,000,000 men and women. Though the number employed in the U. S. automotive industry showed no increase in 1952 over 1951, there was a significant rise in wages. In 1953 the U. S. Government agency in charge of materials allocation, the National Production Authority (NPA), may decontrol the use of steel. NPA already has granted the industry enough stainless and alloy steel to build many additional cars and trucks for civilian use.

With each passing year also new marks are being set in worker pensions, welfare measures, production methods and new developments.

This sprawling industry had its beginnings in the United States in a ban on a side street in Springfield, Massachusetts. It was there, in 1893, that Charles E. and Frank Duryea were credited with

building the first gasoline-engine automobile in America.

When this first crude Duryea car was born, a number of European firms already were making hand-built cars of fine craftsmanship. All of the basic automotive inventions—engines, carburetors, ignition, transmission and others—came from Europe. Until 1906, Europe led the world in automotive production.

But European car makers were still using hand tools as late as 1910, whereas American companies had developed mass-production machinery by 1901.

Scores of new American companies entered the field each year in the early part of the century. Each added some new ideas or engineering principles.

Most of these companies did not survive. Of the nearly 1,000 motor vehicle companies that entered the field, only about 140 remained in 1916.

The first big step toward mass production began in 1901, when a car was produced with standardized parts and assembly-line methods. The car weighed 700 pounds and sold for $650. The young industry was startled when production reached 425 the first year.

Henry Ford, founder of the huge Ford Motor Company, carried the idea of mass production still further. In 1913, he adopted the mechanical conveyor–assembly line, which cut the time needed for car assemply from 14 hours to one and a half hours.

By 1916 the famous Ford "Model T", was selling for $365. As a product, it was simply a tool for personal transportation. It made no concessions to comfort. It ran and was reliable—and it sold by the millions.

All in all, some 1,500 recognized motor-vehicle companies have produced more then 100,000,000 cars of 2,500 different makes in the United States. Today, competition has narrowed the list down to 56 companies producing 21 makes of passenger cars, 39 makes of trucks and 20 makes of motor buses.

At the present time, the car buyer in the United States can choose from 175 different types and body styles.

In cost, passenger cars fall within three general price groups. Lowest priced are Ford, Chevrolet and Plymouth, which sell from approximately $ 960 to $ 1800. In the middle group are Nash, Mercury, Studebaker, DeSotto, Hudson, Dodge and others, which sell for approximately $ 1800 to $ 2,600. The most expensive group includes Cadillac, Lincoln, Packard, Chrysler and Buick.

The manufacturing end of the industry encompasses about, 3,000 plants scattered over 45 states. There are 112 final assembly plants, located in 77 cities in 24 states and operated by 56 different companies.

The bulk of the industry is located in Detroit, Michigan, which calls itself the "Automobile Capital of the World." Here are the giants of the industry, General Motors, Ford and Chrysler who produce 87 percent of the entire output.

Many automobile owners in the United States also own a small interest in the company that produced their car. U.S. motor-vehicle companies have more

stockholders than employees. In many instances, employees of an automotive company own a substantial part of the company's stock. In every company, many small stockholders, rather than single investors holding a large number of shares, own the majority of stock. One of the largest U.S. automobile companies reported in 1948 that its 8,700,000 shares of stock were owned by 55,000 individuals and families, plus 5,700 institutions and firms. The largest single investors were 220 educational and religious institutions, 151 insurance companies, 116 banks, 96 charitable organizations and 52 hospitals.

Evidence that America is a "nation on wheels" is seen in the increasing number of services made possible by mobile units. In addition to the popular drive-in theaters and restaurants, a church in California, the state with the largest number of automobiles per capita, recently arranged a drive-in, open-air church service at which the congregation remained in their cars. Drive-in banks which allow a driver to lean out of his automobile windows to transact his business with the bank also are becoming popular.

Automobile delivery services offered by department stores, groceries, dairies, bakeries, and laundries long have been considered a matter of course. In addition, new ways constantly are being devised to serve more people more often by automobile. Some new services are the travelling grocery store, which saves the housewife a trip to the market, and mobile dental and medical equipment including X-ray machines and complete laboratory facilities. These units provide up-to-date scientific facilities in areas remote from cities. Other new services include the "frozen foodmobile" which delivers frozen foods to the houswife's doorstep. "Bloodmobiles" operated by the American Red Cross provide mobile facilities collecting blood for use in hospitals and for the armed forces. Travelling libraries called "bookmobiles" bring the best in literature to country hamlets.

The research and productive power of the U.S. automotive industry met its greatest test in World War II and stands ready again to resume production of arms for the free nations if that should become necessary.

During the last war, the U.S. automotive industry alone accounted for one-sixth of the nation's war production: 26,000 bombers, fighters, and gliders; 450,000 aircraft engines; nearly 3,000,000 tanks and military vehicles; and 6,000,000 guns—a total over 1,000 different products.

The manufacturers have announced that they face the future with confidence and are continuing their efforts to bring a better product to more people through the application of mass-production machinery and industrial research to scientific discoveries.

The United States has about 63 million motor licence holders to a population of 157 million. The increased purchase of cars every year is proof of the rise in standard of living.

The outlook this year is bright. The industry has decided to hold the line on prices. In fact, the most competitive

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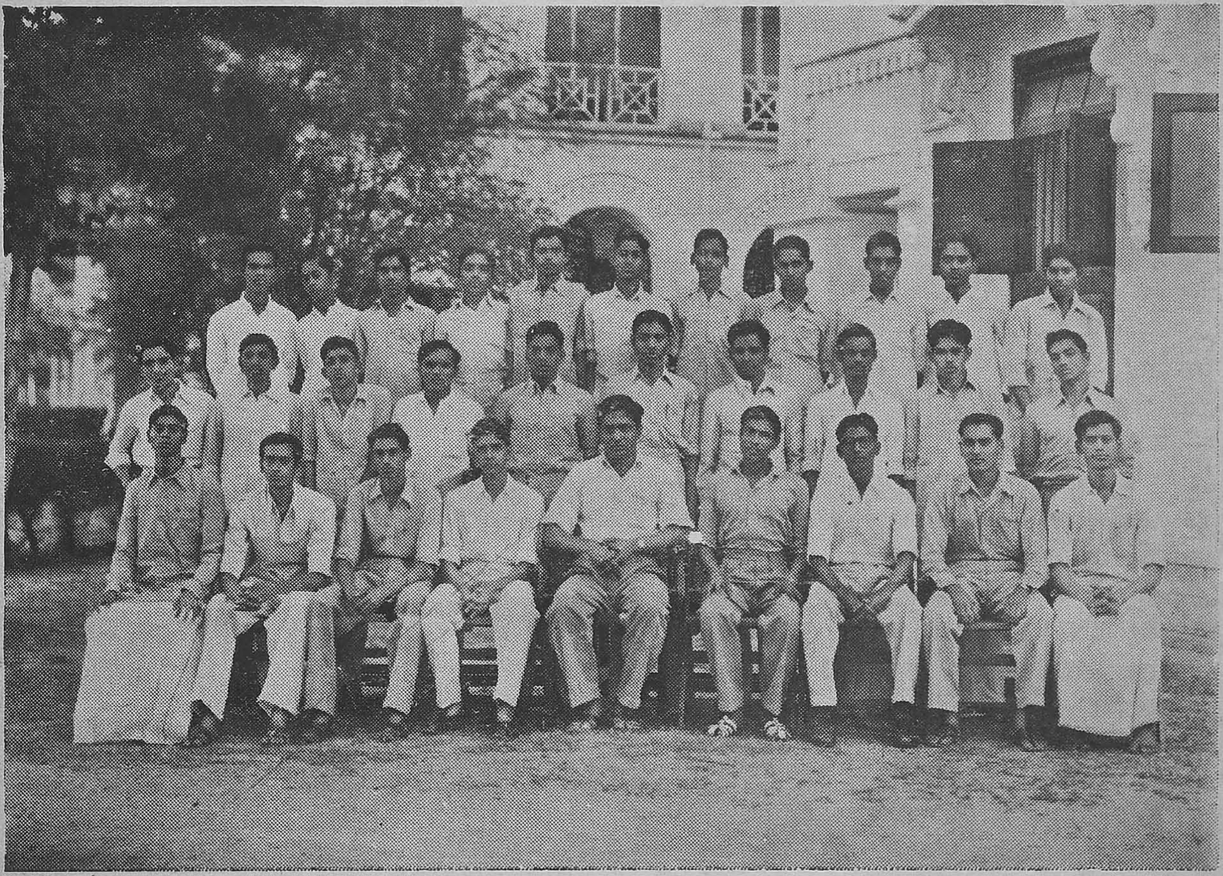
FIRST YEAR L. A. E.—(1953-54)



Sitting (L. to R.) :— Ghanashyam Acharya ; K. S. Sreedharan ; K. Sreenivasan ; T. Balasubramanian; Sri S. Jagannathan (Principal) ; S. Kalyanasundaram ; P. Venkataraman ; S. Sadasivam Naidu ; V. Subramaniam.

Standing I row (L. to R.) :— V. Krishnamoorthy ; P. Mallikarjuna Chetty ; S. Balasubramaniam ; C. Venkatasubhiah ; G. Venkataraman ; K. Nagarajan ; P. V. Subramanian ; S. Subramanian ; K. Vaidhyanathaswami ; R. Santhanam.

Standing II row (L. to R.) :— C. Krishnamoorthy Rao ; V. Ganesan ; T. S. Arunachalam ; P. S. Venkataraman ; M. L. Rangarajan ; D. R. Sugavanam ; D. Rajaraman ; K. Sankaranarayanan ; P. V. Santhanam ; U. Thiruvenkatacharilu ; V. Sivaraj.

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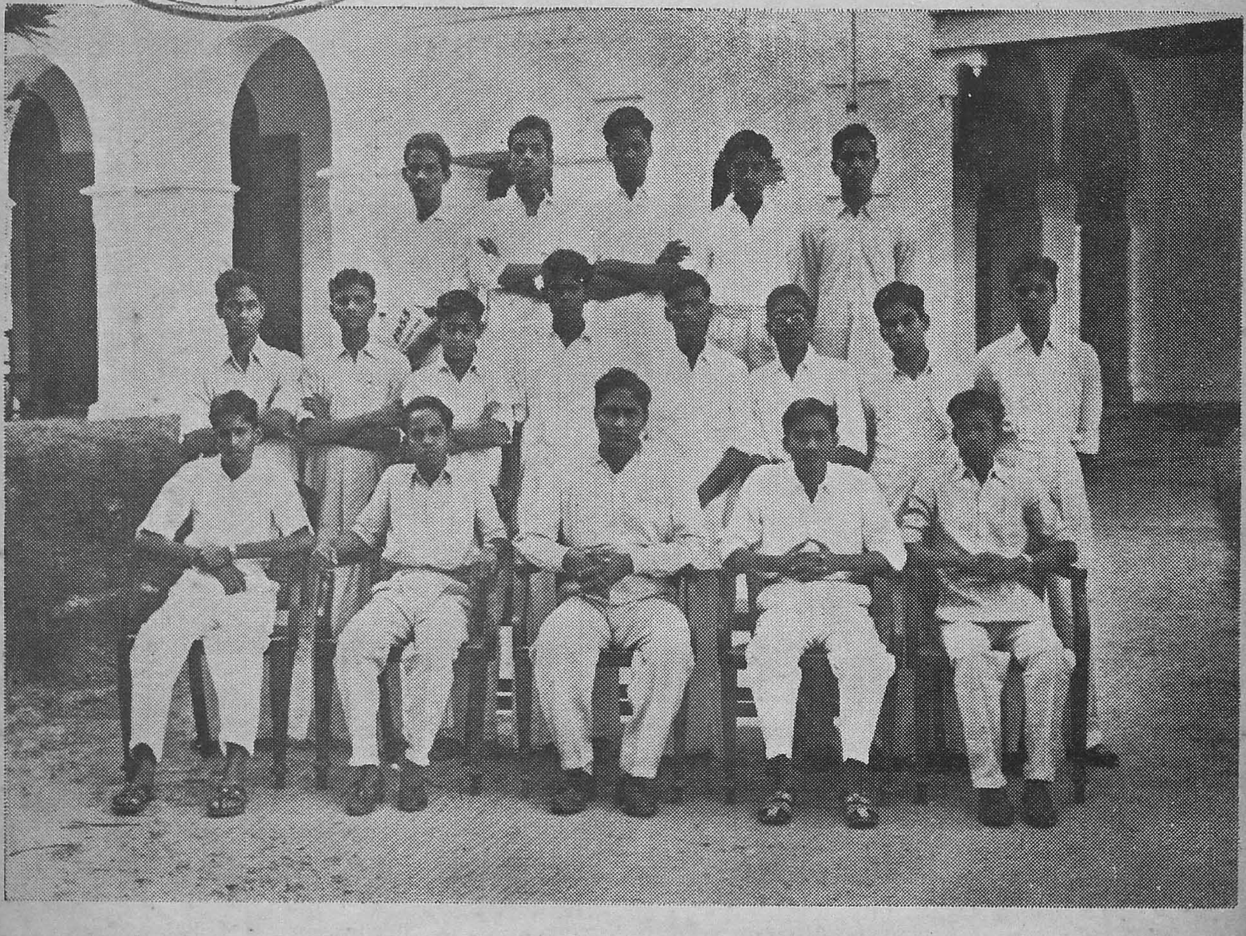
SECOND YEAR L. A. E.—(1953-54)



Sitting (L. to R.) :— T. S. Madhavan ; T. K. Chandrasekharan ; Sri S. Jagannathan, *(Principal)* ; S. Soundappan ; P. N. Krishnan.

Standing I row (L. to R.) :— R. Natarajan ; S. Nagarajan ; S. T. Ramachandran ; V. R. Swaminathan ; K. Ranganathan ; G. N. Satagopan ; T. R. Subramanian ; K. Lakshminarayanan.

Standing II row (L. to R) :— S. Someswara Sarma ; N. Mahadevan ; N. Srinivasan ; M. R. Satchithanandam ; N. R. Subramaniam.

market since World War II demands that prices be reduced wherever possible.

The big style note for 1953 models is the re-introduction of wire wheels on higher priced cars. Power steering, which simplifies parking, is spreading throughout the industry. Tinted glass soon will appear even on trucks. Greater use of plastics is evident.

But the American automotive industry is a phenomenan not alone for its mechanical and technical achievements. In human relations as found in the dealings between workers and management it is in the forefront also. The United Automobile Workers Union (UAW) has become a powerful factor affecting all American life.

This huge democratic organisation has been almost invariably successful in winning gains for its members in the form of higher pay, better working conditions, paid vacations, seniority rights and other security benefits. Through united strength, workers have succeeded in gaining a greater share in their productivity. And when UAW has led the way, other labor unions have soon followed.

One agreement worked out between UAW and management set up a sliding scale for workers' wage increases— or decreases—corresponding to a rise or fall in the general cost of living.

Statistics gathered by the U.S. Bureau of Labour Statistics periodically show whether the cost of living has risen, remained steady or dropped. Food, clothing and shelter are the basic costs comprising the measurement. If there has been a rise in the general cost of living, management agrees to pay higher wages to the workers. If the cost of living drops during any period, workers' wages are reduced.

Experience until now has shown that changes in workers' wages occur frequently but in small amounts. Usually the change has amounted to about 1 cent an hour or 40 cents a week (about 2 rupees). Average wage for automotive workers is about $ 70 a week (Rs. 350). Skilled workers, of course, receive more than the average, while unskilled workers receive less. But the worker is paid according to the work he does. Negro workers earn exactly the same pay as white workers doing the same jobs. UAW was one of the leaders in integrating the races.

One simple reason for the enormous growth of the American automotive industry is that people in increasing number have had the money to buy cars. Almost every worker in the automobile industry itself, for example, owns a car. He can afford it because his wages are high—and they are high because he shares more than ever before, and perhaps more than workers in any other land, in his own productivity.

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Workers leave an U. S. automobile factory at the close of day.

TIT-BITS:

Trouble-free

Car-owner: "I have had this car a whole year and haven't paid a pie for repair or up-keep since I bought it!"

Friend: "So the man at the service station was telling me".

Second-hand

Mr. Gany: "So we have bought a second hand car cheaply. Now I should possess a driving licence. How much would it cost?

Broker: "Good! it will cost some-where near Rs. 75".

Mr. Gany: "Why not get a second hand licence? That would cost less, Is n't?

South Arcot Lignite Deposit

S. BALASUBRAMANIAM, *III Year L. A. E.*

A new discovery has presented its scopeful aspects recently and is being considered seriously by the engineers. This is what is known as the 'Lignite Deposits in the South Arcot district'. It is likely to play a vital part in the future industrial development of this part of the country.

Lignite, is a solid fuel coming under the category of coal. It has a calorific value lower than anthracite coal and yet useful in many ways such as for domestic purposes. The prospects of the lignite is more pronouncedly felt only after the recent discovery of its abundant storage in the underground mines in South Arcot district.

The deposits are found near Naiveli Railway Station which is on the Vriddachalam–Cuddalore branch line of the Southern Railway. Along with this there are found artesian wells which supply an abundant quantity of water. It is found that the coal field extends over an area of 100 sq. miles with the thickness of the deposit varying from 20 to 100 feet. The area under the pilot scheme is 17 miles long and 6 miles wide. The total quantity of lignite that is deposited is estimated at about 2000 million tons. There is also another field lying to the north and the deposit is expected to give more than 400 million tons. The pilot mining undertaken by the Government of Madras comprises an area of about 600′ × 600′ at the ground level and 100′ × 100′ at the bottom. The sides are sloping at a rate of 15′ to 20′ per foot. It has been found that a 100′ × 100′ lignite bed would yield about 20,000 tons.

The coal is presented in four different forms in between sand stone and clay. The different forms are peaty, woody, lignite and coal.

This is the extent of the actual field as it presents itself to us. Turning our attention to the benefits of lignite it is a very cheap fuel, cheaper than other kinds of coal. The important by-products are char, lignite-tar, pitch, lignite oil, montana wax and china clay. The char is just like charcoal and can best be utilised for domestic purposes such as for stoves etc. It can also be used as a fuel for gas plants, due to the fact that it has a great staying power. The char can be pulvarised so that it may be used as a fuel in coal turbines. The lignite tar is used in metalling road surfaces as also the pitch. The oil obtained from lignite is similar to crude oil. It can yield, by fractional distillation, 50% of its weight, creosote oil and other lighter oils. Creosote oil is useful for preservation of wood, and it can be used by hydrogenation for the manufacture of petrol. It will also form a basic raw material for many chemical industries. Montana wax is extensively used for electrical insulation and in electrical industry. It is also used as a basic ingredient in furniture polish and ammunition manufacture. China clay can best be used in manufacturing high quality refractory fire-bricks, porcelain-ware and electrical insulators. Good china clay is of utmost

importance for textile, paper and rubber industries.

Not far from Naiveli is situated the Salem iron Ore hills. Thus by utilising the lignite with this ore, we may be able to reduce the iron ore to almost pure iron. Lignite and iron ore mixture can also be used after being briquetted. The cost of coal used in thermal power generating stations is as high as 80% of the cost of generation. Besides, there is considerable difficulty in transportation which means costly power generation.

From the foregoing, the benefits of this lignite deposit may be well realised. It is anticipated that with a firm supply, the generation can well meet a load demand of about 300,000 KW within the next five years. The establishment of a large superthermal power station at Naiveli of the order of about 200 million watts is already envisaged and is under active consideration.

Let us sincerely hope that in the coming ten or fifteen years the deposits of lignite will be fully utilised to make the country highly industrialised and prosperous.

"The Storage Battery Industry in India"

S. PRASADA RAO, *III Year L. A. E.*

The battery in Automobile Industry is the spark that drives Automobiles. India is making it and in the near future all our requirements will be met by indigenous production.

The existence of a well organised and efficient storage battery manufacturing industry in India is of vital importance to her growing automobile industry. Every automobile to be on the road, as the report of the Electrical Machinery and Equipment Panel 1947 points out, needs at least one storage battery performing the essential functions of starting lighting and ignition. It is therefore most gratifying to note that the entire requirements of the automobile industry is being met out of the current local production.

Like the automobile industry the enterprise of storage battery manufacture is largely a postwar growth. The industry was started in India in 1932 and its average pre-war capacity was just 35,000 sets per year. This capacity was again not for manufacturing complete batteries but plates alone. Thanks to the sustained efforts of the promoters of this industry and the sympathetic consideration accorded to the industry by the Government, the storage battery industry in India enjoys heavy protection, the rate of tariff duty bearing 86% on batteries of U. S. or non-common-wealth area manufacture and 6% less in the case of U. K. batteries—the industry is now able to manufacture over a lakh of batteries per year.

The assembling capacity of the firms engaged in the automobile manufacture has risen to about 80,000 vehicles, a year, from pre-war average of 30,000 and rise

in production level of storage batteries seems to be in direct proportion to the growing demand in the country.

Storage batteries are also extensively used in other modern mechanised transport, i.e., the railway, shipping and aviation. These transport systems rely on batteries for starting, lighting and other operations to a great extent. In some colleges, storage batteries are used for storing the current from Dynamos and then supplying the required amount of current to the Scientific laboratories. In railway trains, besides being used for lighting purposes and operation of fans, batteries have found new modern usages, such as air-conditioning, railway signalling, for track and signal circuit and switching locomotives.

The marine applications for batteries are many sided. These applications include assuring continuity of power for lighting and wireless. On naval vessels, current for transmitting, signalling and switching and other forms of telephone service is provided by batteries. In the aircraft industry batteries supply current for engine cranking, radio, ignition, navigation instruments, landing gear, cabin lights and power apparatus. In places not served by central station power, farm lighting batteries are generally in use. High potential batteries are in wide use in Broadcasting stations as well as in radio receiving sets.

In holding their enquiry into this industry the Electrical Machinery and Equipment Panel appointed by Government of India, in 1947 after setting out the lines of demand on the battery manufacturing industry estimated that the annual average requirements of the country would amount to a lakh and a half batteries.

No definite figure can however be given as to the number of batteries imported. Accounts of Sea borne trade published by the Govt. of India, Ministry of Commerce, do not give separate figures for storage and dry batteries. The Panel also found this to be a handicap in pursuing their enquiry to its proper conclusion. Hence it is difficult to give the exact figures about imports and the money spent upon them. There are so many fluctuations in the prices year by year. The Government's import control policy has perhaps got something to do with it. At present in India there are eight important firms—foreign and Indian—engaged in the manufacture of storage batteries of theirs. The three of these are really large and the rest are medium. Besides that, there are numerous small firms employing between 20 and 30 people are producing batteries. they have generally to depend upon the But bigger ones for the supply of plates The types of batteries manufactured in India are those of 6, 8 and 12 volts and batteries of higher voltage have got to be imported. At present India is manufacturing only lead acid batteries according to the standards and specifications laid down by the consumers and the Government. Some of the firms claim their capacity to manufacture nickel-iron and nickel cadmium batteries, but it is said that lack of demand for the latter type of batteries is discouraging them from embarking upon this costly enterprise. As it is, the prices of lead acid batteries are quite high ranging between Rs. 85/- and Rs. 150/- and those of nickel-iron and nickel-cadmium will be much higher still.

Some trading and consuming interests are complaining against the higher rate of protective duty imposed on imported batteries but there seems to be reasonable ground for this imposition. Lead, antimony and sulphuric acid are the essential raw materials for the manufacture of batteries and India has got to import lead metal, antimony metal and rock sulphur, being herself very deficient in natural resources of these commodities. Production of sulphuric acid has reached adequate proportions, but that of lead and antimony do not cover the consumption requirements fully. India produces about 600 tons of lead as against an annual consumption of 12,000 tons and all the lead produced in India is directly consumed by the Government. India has no antimony ore and has therefore to import the same from Bolivia for the consumption of the only small plant at Bombay. Moreover production trends of these metals has recently shown alarming decreases. The high prices of lead and antimony in the international market at the moment must naturally add to the cost of production greatly and on that account alone, more than anything else, the high tariff rate is justified.

So far we have seen only the current usages of electro-chemical product and nothing about its potential usages which can be equally wide.

India's vast country side and the departments of posts and telegraphs which must develop with the uplift of villages are the two-great sources of use for storage batteries. The demand will considerably increase with the development of large scale electrification schemes, the postwar development of Indian posts and telegraphs department, general industrial expansion and development of the railways, shipping and civil aviation.

In passing it may be mentioned that according to the datas compiled by the Central Electricity Commission, Simla, rural electrification registered a marked progress in India, particularly in the States of Madras, Mysore, Uttar Pradesh and Punjab. The number of villages with a population of 5,000, covered during the previous year, rose to 2118 as against 1295 this year.

Besides the different avenues of home demand for batteries, the storage battery manufacturers can reasonably look forward to large export markets in the neighbouring countries of Burma, Ceylon and Pakistan, when the full installed capacity of the Industry is reached.

TIT - BIT

SPECIALIST

Ramu :—Friend ! See there goes our Professor in Mechanical Engineering.

Kittu :—Yes Ramu, I remember. You told he is a specialist in something ?...? ?...... ? ? ?

Ramu :—Yes; he is a specialist in *boring well(s).*

Accidents

(CAUSES AND HOW TO PREVENT?)

N. MAHADEVAN, *II Year L. A. E.*

Accidents, in general, may occur from innumerable reasons and sources. The automobiles play an important part in the above. It will be possible to imagine the rate at which the automobiles do destructive work from the following statement :

> "The number of deaths in seven years of the World War II is only 80% of that which took place due to the car accidents in the same period".

It is quite possible, to bring down this rate of destruction caused by the automobiles, if we think over the chief reasons for the above and try to eliminate them in future.

The chief reasons for accidents may be said to be the following :

1. Lack of proper roads to meet the traffic need.
2. Violation of traffic laws.
3. Inefficient controls or failure of controls.

It is possible to eliminate the above causes to a great extent and reduce road accidents, provided the Government and the public co-operate in the matter. The Government should try to provide the public with wide good roads. It should strictly enforce the traffic laws and not allow eccentric and weak persons to drive vehicles. The brakes should be increased in effectiveness along with the increase in the speed of modern vehicles. Superior design of steering and brake should go along with the increased speed to eliminate the third reason.

But even after taking all these steps, there may occur cases which cannot be avoided. This is a constant for all the duration.

So if we take letter A to represent the accidents, it may be said to be equal to $KNS/TC = A$, where K is the const., N the no. of cars, S the speed, T the traffic laws, C the efficiency of controls provided in the vehicles. It will be noted that each member in the numerator acts to increase the value of A while those in the denominator do the reverse.

Though it is not possible to eliminate all traffic accidents much can be done to reduce the loss of life and property by insisting on certain minimum standards of driving ability before issuing licence to drivers, by superior brake design, by better traffic signals, deterrent punisment for infringement of traffic rules and speed limits. But it is very doubtful if the road accidents will decrease in the future with the great craze for more and more speed and the high rate at which the number of motor vehicles are increasing on the road.

Railway Workshop at Perambur

M. SRINIVASAN, *III Year L.A.E.*

All Stud nts' Associations have in their list of extra-curricular activities, the arranging for excursions of educative value. Our association takes keen interest in excursions of Technical value as these help the students to understand the engineering problems best. Our Association arranged for many excursions during the year, but the one which attracted me more than any other was our visit to the Railway Workshops at Perambur on the 4th of December 1953.

That day we got up earlier than usual and got ourselves ready for the day's programme. The weather was fine and cool and the climate ideal and we started at 6-30 A.M. in a happy mood for the Perambur bus. Our party consisted of 38 students and so it was divided into two groups of 19 each and each group was headed by one of our lecturers.

Luckily we got the bus in time and by 7-30 A.M. we got down at Perambur and we marched towards the carriage works—the workshop has two main-divisions (1) the carriage works and (2) loco works, and it was so arranged that while we go round the former in the morning the other party will be visiting the latter and in the afternoon *vice-versa.*

It was exactly 8 A.M. when we stepped into the carriage works. This consists of eight sections.

We were first taken round the carpentry section. Here all the machines are on the first floor and the driving motors are in the ground floor. There are a number of big and small band-saws and various types of machines suitable for planing, grooving, cutting, sawing and other types of wood-work. In the disc type saw I noticed two varieties. In one the disc simply revolves and the work is fed in; in the other the disc not only revolves but also runs through the work which is stationery. I also saw a machine in which we can prepare wood pieces for half lap joints etc. For making rectangular slots for jointing, there is a special machine the tool of which is a drill bit followed by a rectangular cutter. As the tool is pressed down on the wood the drill bores the wood and the cutter trims off the sides. Overhead cranes are used to convey the wood to the machines and to take away the finished jobs. One thing that attracted me was the arrangement made for collecting the saw-dust. The dust from each machine is sucked through huge pipes into a huge duct leading to a huge storage tank and from this it is collected by waggons. The carpentry section is self-contained having a tool reconditioning section. Small cracks in blades are punched to prevent their developing further. The blade teeth are shaped correctly by a small handy machine. All teeth are ground to the correct angle by automatic grinders. The stone is set at the required angle. After one tooth is ground the grinding stone automatically moves up and the next tooth is brought under the stone as the belt moves by the distance of one tooth automatically. Again the grinding stone is lowered, it grinds the tooth and goes up and so it goes on till all the teeth are ground.

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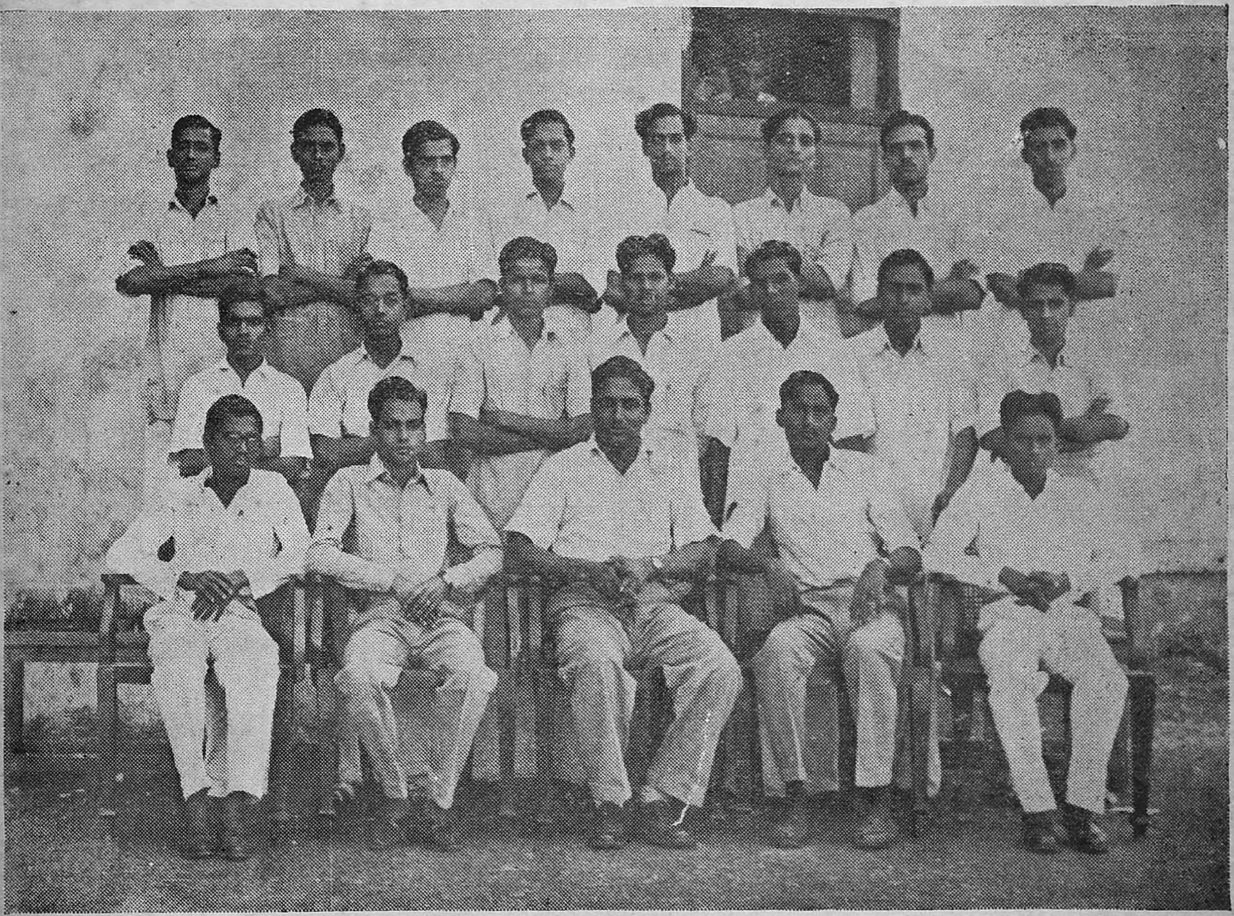
THIRD YEAR L. A. E.—(1953-54)



Sitting (L. to R.) :— P. S. Sankaralingam ; A. R. Swaminathan ; Sri S. Jagannathan *(Principal)* ; A. T. Prabhu ; K. Umamaheswara Rao.

Standing I row (L. to R.) :— S. Sanjeeva Rao ; S. R. Varadachari ; R. Gopalan ; S. Prasada Rao ; V. B. Gopalan ; K. Venkatesalu ; G. Jagadeesan.

Standing II row (L. to R.) :— M. Srinivasan ; S. Balasubramanian ; P. S. Sundaresan ; T. R. Ramakrishnan ; V. Sankaran ; S. Santhanakrishnan ; K. Padmanabhan ; K. V. Natarajan.

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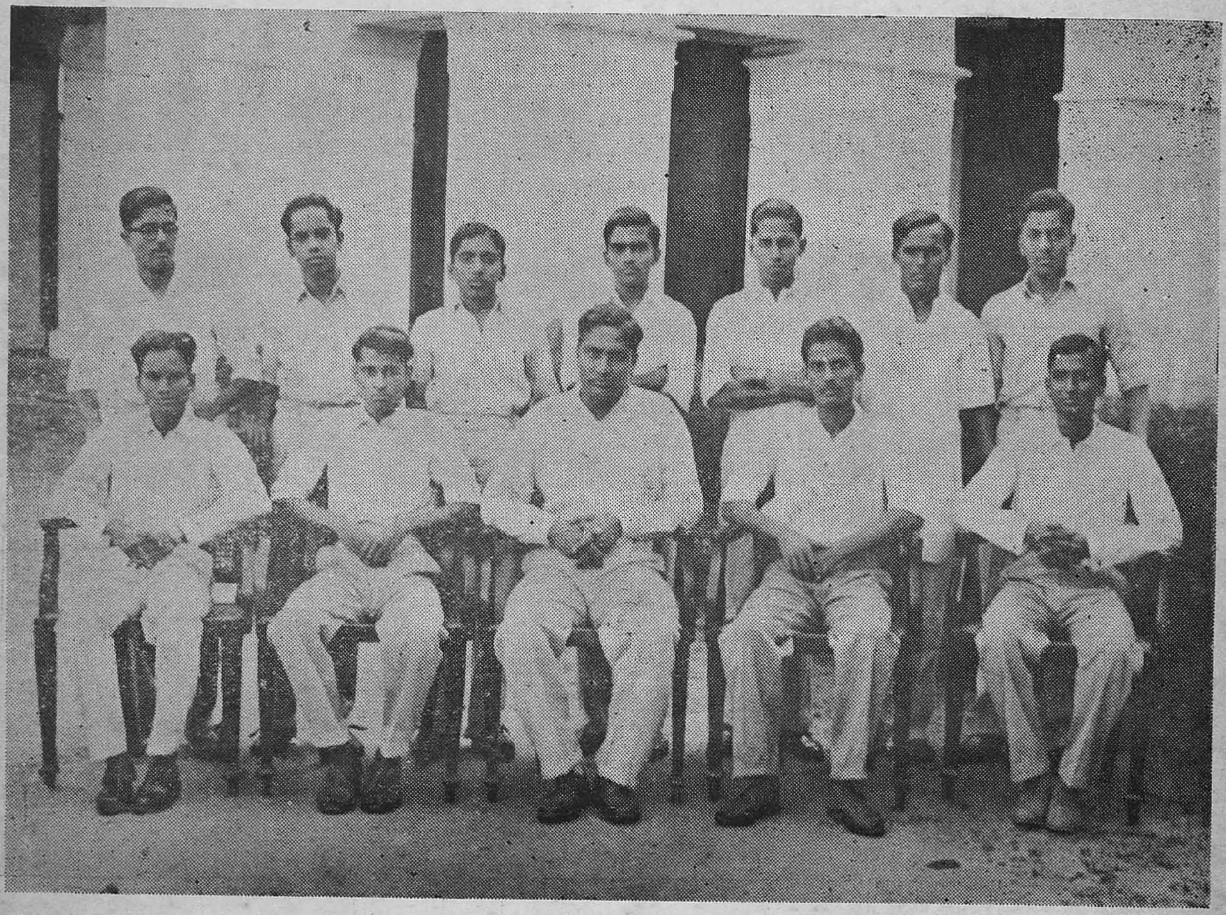
The Automobile Engineering Students' Association

EXECUTIVE COMMITTEE (1953-54)



Sitting (L. to R.) :— K. Umamaheswara Rao *(Joint-editor)*; G. Jagadeesan *(President)*; Sri S. Jagannathan *(Principal, Ex-officio-President, Editor & Publisher)*; S. Someswara Sarma *(Secretary)*; M. Srinivasan *(Joint-editor)*.

Standing (L. to R.) :— G. N. Satagopan *(Sub-editor)*: T. K. Chandrasekaran *(II year Representative)*; P. S. Venkataraman *(Vice-President)*; S. Sanjeeva Rao *(III year Representative)*; K. Sankaranarayanan *(Asst. Secretary & Treasurer)*; C. Venkatasubbiah *(Sub-editor)*; G. Venkataraman *(I year Representative)*.

There is a special brazing machine to join the two ends if a band saw blade should break. Straightness of the blades is also checked and corrected.

Next we proceeded to the spring section. Here springs are both manufactured and reconditioned. This section has power hammers and huge tanks of water to quench the heated iron. The main leaf of the spring is heated at the end and the eye is rolled in two pressings, in an automatic machine. The camber to the spring plates is given by cold-beating. The rectangular bracket for holding the plates together is made here and fixed. There are ordinary brick hearths and also an oil-fired furnace. There is also a steam engine operated pump which pumps water, probably for the hydraulically operated power hammers. There are also a number of punching machines.

The general section contains various machines like, vertical shaper, radial drilling machine and slotting machines as also huge lathes. I was much attracted by the pneumatic rivetter. I observed the riveting operation being done with it.

Next we went to the brass bearing section in which the bearing in the axle boxes of carriages are reconditioned as also the journal of the axles. The white metalled axle bearings are scraped by fitters and bedded to their respective journals. The threads of bolts and nuts are cleaned by chasing machines. There is also a radial drilling-cum-tapping machine.

In the bearing turning section the journal of the axle is ground accurately. The portion of the axle to which the rim is fitted has a slight taper and the rim is pressed on to it with a pressure of about 80 tons.

In the carriage repair section the wheel rims are turned outside and inside at the same time in huge lathes. The work is set between the centres of the lathe by means of overhead cranes. Here is a machine to extract the rim out of the axle by side pressure. It is a grand sight to see here the railway carriages being lifted up from the chassis by huge cranes and moved about in the air.

In the carriage construction section, all wood prepared in the carpentry section are joined in the frame work in accordance with the blue prints and the complete carriage is constructed, the necessary accessories like lights, fans etc. being fitted. Dynamo und accumulators are fitted under the body of the carriage. At the time we visited, a most up-to-date and completely air-conditioned coach was being built up with all modern conveniences that can be desired. The huge carriage is meant to accommodate only 14 persons. The estimated cost for constructing this single coach was reported to be Rs. 1,50,000 and the fare for travelling in that carriage As. 2½ per mile.

The next was the painting section. The main feature of this section is the adjustable platform for the painter to sit upon while painting at different heights. Of course, the painting was of a high order.

The last one is the trimming section where the seat cushions are fitted and the finishing touches are given before the completed carriage is put on rails.

By now the time was 11-40 A.M. It was lunch time and we all took our lunch in the shade of a large tree and rested ourselves for a while. We then started off to the loco-works. Our party reached the loco-works and at 1 P.M.

we entered the shop. This shop also has eight sections.

The machine shop consists of a large variety of machines such as vertical milling machines, turret and capston lathes, huge planers etc. Loco cylinder and valve-casing machining is done here. We saw a cylinder, cast here itself, lying here ready for machining. They are preparing a hug jig to enable them to machine two cylinders in one setting. The coupling rod is forged solid and then the "I" section is made by milling.

In the loco-repair section we were able to observe almost all internal parts of the loco engine, as two or three of them were completely dismantled for overhaul. We observed the crosshead. We found two types of arrangements of cylinders. In the one, the linkages are all outside with connecting-rod connected to a crank pin on the wheel itself. In the other the axle is built as a crankshaft and the coupling rod is connected to this and the link motion to D-slide valve is obtained from an eccentric on the crankshaft-axle. The tender wheels (two small front ones) are mounted on double taper roller bearings. The connecting rod end has a brass bearing surface. In this section we were able to observe how the interference fit is made. The tyre on the rim of the wheel is heated in an oil-furnace and the axle along with the rim is dropped into it. Of course all are done by overhead cranes.

In the boiler section, boilers are both constructed and repaired. We went inside a boiler which was lying there for repairs and observed the construction. The riveting is done by hand only, the rivet being put in and heated by welding torch. All boilers are tested for leakage and all safety valves are tested for timely action. One thing I noted was that the fire door is made of two plates, one copper (inside) and the other steel (outside) I also saw a punching machine by the side of this section for making washers of various sizes.

Next section we went to was the Wellright shop. This shop is called so for all the machines in this section are of the Wellright make. This has a big machine to test the tensile strength of crane chains, coupling rods etc. New machine hammers are lying here ready to be fixed up on foundations. The other machines in this section are Hobbs, gear cutting machines etc. I also noticed an end-mill tool in operation.

The bolt and nut section consists of automatic machines for making bolts and nuts and also rivets having countersunk and snap heads. The bolts and nuts are died and tapped automatically in gangs.

In the brass foundry the axle boxes and other things are moulded and cast. Most of the furnaces here are oil-fired. The overhead crane here is operated manually. Even internal and external threads are moulded here as well as various pipes and safety valves for the engine.

The biggest of the power hammers is found in the next section. An eccentric sleeve was being forged in it at that time. The stroke of the tup and the pressure of the blow are controlled by the operator while the work is fed properly by four men and another man clears off the scalings from the work frequently. The co-ordination with which these men do the work arrests one's attention. There are a number of other small hammers in which various other jobs are done. The hearths here are of both the brick and the cast-iron chimneyless type.

The heat treatment section has the ordinary smith's hearth, oil fired and also an electrical furnace with pyrometer attachment.

The iron foundry is one of the biggest sections here. There are more than four cupolas with a capacity of 6 tons each. The metal tapped rushes out so rapidly that while blocking the outlet hole there is so much of spillage. The molten metal is carried in big laddles by overhead cranes and the laddles are tilted against the mould by a worm gear arrangement. There are two cranes at different levels one over the other and they are operated very carefully. The foundry also contains sand-mixer, fetling machine etc. The pattern making section attached to this makes it self-contained.

To help all these sections, there is the tools and jigs section. Here, there are a number of precision grinding machines, diamond cutters etc. and there is also a fitting section attached to this.

The above is by no means a complete description of the workshop, for our one day visit is quite inadequate to observe all the details.

There are a number of traversers to carry the carriages from section to section. Small trucks and automobiles also play a good part in transportation of materials and perhaps that is why frequently we found the board "Beware of automobiles".

We were not only impressed by the vastness of the shop and the hugeness of the machines, but also by the general layout of the works and the machines. Almost all machines have drive units attached to them and belting is dispensed with.

When we came out after finishing our visit to loco works, it was 5 O'clock and the whole day we have been walking from machine to machine. Though the time at our disposal was inadequate to learn the details, the excursicn made a deep impression in our minds and many of us for the first time saw such a large number and variety of machines, some of them precision, some very huge and some small, came to realise the vastness of the engineering field and the great progress so far made. It is impossible to adequately describe our grateful thanks to the organisers of the excursion and to the Chief Mechanical Engineer, Railway workshop, who permitted us to go through the workshop.

Tit bit

RIC(S)E

Server: *Rice*? Rice? Rice??

Served: (angrily) No, I won't *rise* until the last item is served.

In the Life of a *Service Man*

KANDUKURI UMAMAHESWARA RAO, *III Year, L. A. E.*

We students of Automobile Engineering can anticipate and remedy certain defects in motor-vehicles which we commonly experience, but sometimes come against peculiar troubles, the causes of which are not easily diagnosed and set right in the usual way. Let me give you my experience in this direction.

During the last summer my friend and myself drove to the Hills for a picnic in two new Ford Prefects we had recently bought. Both were in very good condition being new vehicles. They were of the same make and year and it will surprise you to know that they were bought on the same day by us and used under similar conditions.

Now, coming to the picnic, it was a fine one and we both enjoyed it so much that when we got up we were alarmed to note that we had left the ignition keys in the "On" position on both the cars for some hours. You see, even in this matter of forgetfulness we behaved in a similar manner!

We both set out in trying to start the engine. My Prefect roared at the pulling of the starter knob. But alas! my poor friend! His coil was very much heated and the battery run down. What is this? How is it that I could start my engine and he could not? Very very puzzling! Is n't? Yes, after a long search we found out the reason which will seem to you very peculiar of course.

You see, when we left the car, it accidentally so happened that the contact breaker points in my car were in the open position when I stopped and those in my friend's were in the closed position. Thus I escaped from the disaster but my poor friend had to suffer under identical circumstances. We then gave temporary connection from my car battery to the other, cranked and started the other car also and soon were on the road.

Like this we may come across many such peculiar oddities.

We come across not only with some peculiar troubles but some times we meet with false alarms also. We should be on our guard against them, which may make us think that we have struck with some really serious trouble, when all is well. I shall give one such false alarm raised by my Prefect.

Last winter, I drove to my friend's house which is situated in a crowded part of the City. As I reached the house I had to stop the car suddenly to avoid my friend's child which was rushing towards me on seeing my car. Then my friend came out and we both talked for some time. When I returned to my car, I was horrified to see a pool of water under the radiator. A leak? Only last week I had my radiator removed, flushed, tested and refitted and also renewed all hoses. In spite of my paying their heavy bill for this, it is still leaking! I got terribly angry at the service man. But, a minute's inspection won my sympathy for the poor service man who is always the victim of suspicion by the car-owners.

Yes, it is a leak–in a sense, down the radiator over-flow pipe. You see, when I stopped suddenly, the water, mindful of the late Sir Isac Newton, wanted to go on and its only way was down the overflow pipe. I drove on with a calm mind being confident that there was nothing wrong.

The life of the service man is full of such baffling problems and false alarms. In spite of all of them he has to prove his honesty against the suspicious public. So my dear friends! whenever you find a trouble in your car, please do not always make the poor serviceman the victim of your suspicion. Whenever the repair on your car is slightly delayed, please remember that it is not always due to the incapability on the part of the service man but probably due to some extraordinarily peculiar trouble which your car might have presented. There are, in fact, a large number of symptoms that may appear similar but apparently caused by entirely different causes. A motor vehicle has a very large number of parts, some small and some big in various positions and, sliding, rotating, oscillating etc., that if any of them get into trouble the car does not perform smoothly. It is always necessary to approach motor vehicle troubles in a scientific and systematic manner. One should not jump to conclusions and it is no exageration to say that trouble shooting is a specialised art and however experienced one may be, however learned he may be, it is always possible to come across certain peculiar noises or sources of rattle that cannot easily be located with certainty. Only a cool headed person who goes about his job systematically can hope to do a satisfactory repair job on motor vehicles.

Thankfulness

"You cannot be put in a jail for killing time, hanging pictures and murdering language."

Resurgence

Out of earth the rose
Out of night the dawn
Out of my heart with all its woes
Great courage to press on.

"True friends visit us in prosperity, only when invited; but they come uninvited in our adversity."

—*Theophratus*.

"If we could see ourselves as others see us we'd never speak to them again."

—*From Lady's Home Journal*.

Timber

T. BALASUBRAMANIAM, *I Year L.A.E.*

Live trees provide pleasure by giving sweet fruits and pleasant shades, by taking carbon-di-oxide from the air and giving out plenty of oxygen enabling the growth of life. Absorbing water by the help of roots and converting it to a vapoury state they cool the climate in the regions around; pleasant green colour of the trees and plants cool our eyes. They provide shelter for birds and animals. Their leaves are fine for animal food, and manure. Many useful things in our daily life such as gum, chlorophyll and medicenes are obtained from living trees. They serve us in getting rain, the most useful factor of things in our life! In such and many other ways living trees have been of great use to men and living beings.

Even after living trees are cut down they remain a material of great benefit. The cut down trees can be classified into two types, viz., the one used as fuel and the other as timber for wood work. In building the houses, bridges, ships, rafts, railway carriages, wagons and railway sleepers, preparing the toys, wheels, carts, dolls, and materials used for agricultural purposes, musical instruments, electric posts, boxes, benches, chairs, sofas, tables, Bureaus almirahs etc., the wood that is made use of is known as timber wood. Teak wood, rose wood, siris, caledonian pine, trincomalle wood, white cedar or toon, satin wood, cannon ball, ebony, Madras asoka, willow, ivory wood, sandal wood and mahogany are the best timbers used in our country.

A living body, after its life is lost will not last long. That means to say, they get destroyed in a short time. Trees also do not escape this formula of nature. Man has surmounted this formula of nature by discovering ways and means of preserving these cut down trees or timbers. The way of preserving the timber has been found out by men considerably a long time before Christ. Egyptians of ancient days were skilful in this work. It is also learnt that the men of olden days used ceder oil, olive oil, spikenard oil, etc., for preserving timbers. It is made clear that the ancient people were familiar with the methods of preserving timber, when we see the temples, forts and castles of our country built centuries ago.

Modern methods of preserving the timber came into existance during the nineteenth century and afterwards in this century. During the last century telegraphic and railway appliances were in enormous use throughout the world, thereby causing demand for wood telegraphic posts and railway sleepers. So men began to investigate extensively and as an effect of this, the first new method of preserving timbers was found out in 1838 A. D. Teak of our country and jarrah of Australia were found out to be naturally unspoiled for a long period. Hence these timbers were in great demand in other parts of the world.

Trees soon after they are cut, hold a large percentage of moisture. Moisture is an inert material in timber and unless it is got rid of the timber gets spoiled soon. The method of removing the moisture from timber is known as "seasoning". Every tree to be used as a timber, first undergoes this process,

This ensures the timber twice its original strength and seasoned wood can be easily utilised in woodwork. As the moisture contents in the wood cells are removed the preservatives can easily occupy these empty cells during the preservation process and enable the durability of wood.

Seasoning the wood in our country is made by two methods namely the shadow or air seasoning and the water seasoning. The first is to keep the wood for sometime in shady and airy places where there is no direct passage of sun-rays. There are many defects in both these methods. Foreign countries adopt mainly three methods, the steaming, hot air seasoning and McNeill's process. During the first process steam supply is conducted for a few hours. In the second, timbers are piled in a room where prevention from atmosphere is made, and hot air at 200°F is passed in between them through small pipes for about three days. The moisture present in wood is absorbed by the hot air and the hot air getting cold, is then taken outside the room by means of pumps. During McNeill's process the timbers are kept in a retort spaced equal distances apart. One-third the space of the retort is kept vacant. Vessels containing the preservatives are kept below the timbers. The top of the retort being closed, heating is conducted. This process continues for about 2 to 8 weeks, in accordance with the type of timber. There are also some defects in the steaming and hot air seasoning processes as in the methods adopted in this country.

When this type of seasoned wood is used in the case of bottom of the ships or boats or railway sleepers or roof of houses or well sides where they are directly attacked by rain, sun, air and water, they easily get spoiled and also eaten away by white-ants. Therefore we have to adopt some other methods to prevent these dangers.

Timber to be prevented from the attack of white ants is coated with creosote or solignum. Again they can be kept in a combined solution of 1 lb. of copper sulphate per 10 measures of water and then taken out for usage.

At present, to prevent damages by white-ants and other causes, the wood preserving methods adopted are (1) the Brush method (2) Powell process (3) Cylinder pocess (4) Bethell process (5) Lowry Process (6) Curd process and (7) Ruping process. The first four are the most important. In all these cases any wood preservative like coal tar, wood tar, mercuric chloride, zinc chloride, copper sulphate or creosote is introduced into the empty wooden cells of the wood. In all the 7 processes, the important object is to introduce any of the above said chemical compounds into the empty wooden cells. In this, two important points will have to be borne in mind. The first is to see that every cell of wood is free from moisture and that it is capable of receiving the chemical preservative. The second is to notice that the wood preservative gets into every cell of wood. If these two works are not complete success of the process is doubtful. Exception is made to Powell's process. It is not necessary for a wood to be seasoned for introduction into Powell's process.

In the brush method, a considerable amount of creosote is poured into a tub and timbers are kept upon them. The enclosed space will be just like a furnace. The bootom of the furnace is gradually heated with the aid of fuel air mixture or steam coils. Heating is stop-

ped when the temperature attained is from 90 to 95°C. and then the whole thing is left to be cooled. Thereby the wood begins to swell enabling the creosote to enter and occupy the empty spaces. During the Powell's process saccharine or sugar mixture is combined with arsenic and employed instead of creosote and others are the same as the brush method. This process is mainly adopted in Australia. Railway sleepers of our country imported from Australia are all prepared by this process. In the cylinder process big cylindrical retorts having 6 to 9 feet diameter and 30 to 160 feet length are used. They are capable of resisting a pressure of 200 lbs. per sq. inch. One side of this retort is opened and the other closed. Railway lines enter through the open space and the wood is taken inside by means of trolleys. Steam pipes are provided below the lines. A separate cylindrical machine containing the chemical compounds is placed above these lines. After the wood is being stored up in the bottom cylindrical portion, the mouth is closed and made air tight. The compounds are now vapourised and introduced under a pressure of 200 lbs. per sq. inch. In this way the vapourised compounds can easily get into the wooden cells. During Bethell's process the wood is stored in a cylindrical retort, and a steady pressure of 100 to 180 lbs. per sq. in. is maintained for about an hour and then the wood is dipped in creosote solution for some time. In this manner a cubic foot of wood gets strengthened by absorbing 7 to 15 lbs. of creosote. Lowry's process differs very little when compared to Bethell's. The pressure is being altered by 190 to 200 lbs. per sq. inch. and creosote, being heated to 200°F, is introduced into the cylinder itself. Thus a cubic foot of wood absorbs about 6 to 7 lbs. of creosote. Ruping and curd processes are not so important though they are nearly the same as Bethell's.

In addition to these processes, paint, varnish, tar and polish serves the inviolability of wood.

Now-a-days artificial timber is prepared in foreign countries. Wood wastes under a pasty condition are mixed with chemicals and cast into the required shapes of timber. They are very fine to look at, strong and cheaper too. There are no defects in this type as in the case of natural timber and no harm is made by white ants and moisture. Hence there is a great demand for this type in foreign countries. At present there are twelve factories preparing the artificial wood. Some of the artificial timber prepared in our country were exhibited in New Delhi during the Railway Centinary Exhibition. The production of artificial timber is gradually progressing in India also.

"Pleasures are fading flowers ;
Friendship is lasting perfume."

"Know your capabilities and worry not about your limitation."

"Success is the flower whose stem is patience and whose seed is toil."

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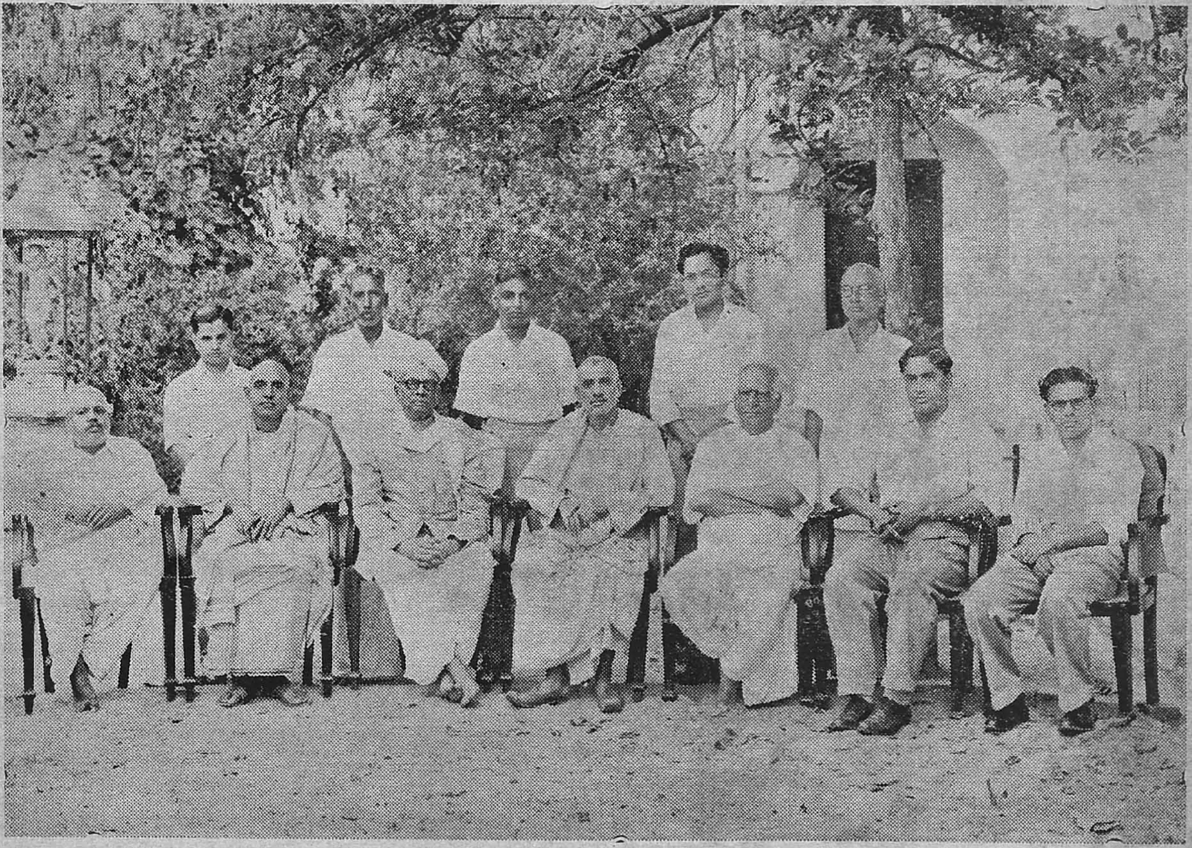

Sitting (L. to R.) :— Sri T. S. Krishna Rao *(Hony. Treasurer)*; Swami Ritajanandaji *(Warden, R. S. Home)*; Sri C. Ramanujachari *(Hony. Correspondent)*; Swami Kailasanandaji *(President)*; Sri L. Venkatakrishna Iyer *(Hony. Director)*; Sri S. Jagannathan L. A. E. *(Principal)*; Sri H. S. Parameswaran, B. Sc., B. E., *(Machine-shop Superintendant.)*

Standing (L. to R.) :— Sri M. P. Jacob L. M. E., *(Asst. Machine-shop Supdt.)*; Sri P. K. Ethiraj *(Driving Instructor)*; Sri C. S. Krishnamoorthy L. A. E. *(Asst. Autoshop-Supdt.)*; Sri T. L. Narasimha Rao, B. Sc., *(Lecturer in Mathematics)*; Sri S. Rangaswami Iyengar *(Clerk)*.

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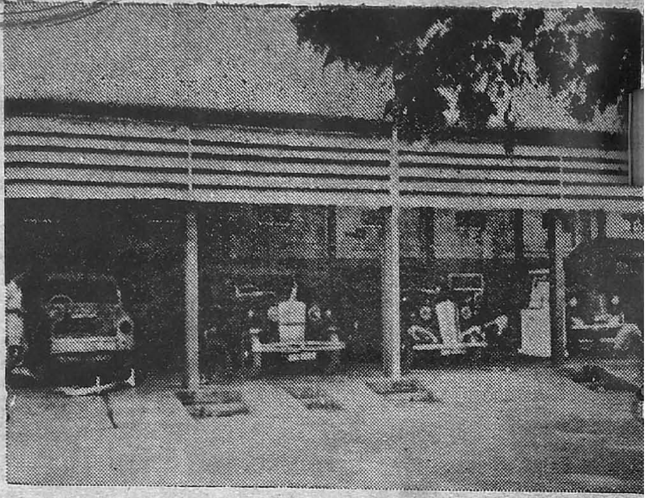
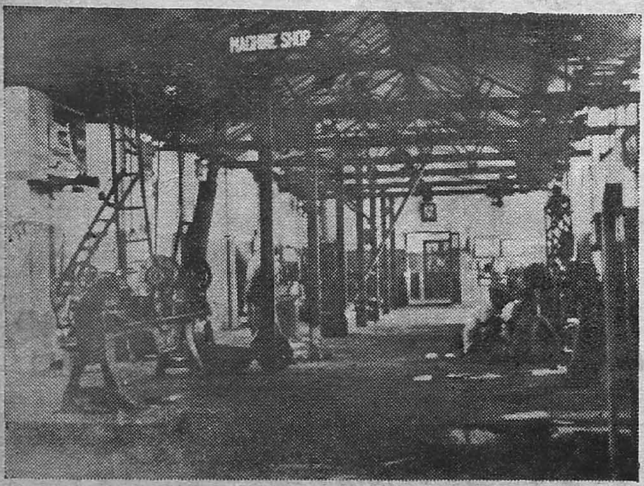
High pressure wash



A view of the Autoshop



A view of the Machine shop

Cutting by Oxy-Acetylene flame

Everlasting Battery

S. BALASUBRAMANIAM, *III Year, L.A.E.*

Seventy-five percent of the troubles experienced while starting an automobile engine may be attributed to the condition of the battery. It is a well-known fact that the battery should be charged full and kept up to provide sufficient current for starting. If left uncared, it dies down and if jolted violently when going on rough roads, it may fail. Adequate water supply for topping up is also needed. Even with all the care and attention that we may give, it has to be replaced several times during the life time of a car.

Thus, the present day lead-acid battery has its own demerits. But a battery which is far more superior to all these lead-acid type of batteries has been in use in the continent for more than 50 years !!! This battery has none of the disadvantages from which a lead-acid battery suffers. Equipped with this battery one need not buy new batteries for his car but it is more likely that he may have to buy new cars for the battery he possesses, for it will last 15 to 20 years.

This battery is the nickel-cadmium battery which most of us would not have come across. The nickel-cadmium battery was first produced in Sweden in 1909 and since then it is being manufactured in Europe. It is used on thousands of Diesel locomotives and buses and also for small portable lamps. It was installed in the "Queen Elizabeth" and "Queen Mary" as emergency power source. In the second world war the Germans used it in their rockets and also the allied forces in their planes and tanks.

The familiar lead-acid battery gives electric energy by means of the chemical action of sulphuric acid solution on a series of lead and lead-per-oxide plates. The nickel-cadmium battery on the other hand functions as follows: It uses a solution of strong alkali, the chemical change taking place between the plates of cadmium and nickel hydroxides. This permits the housing to be an unbreakable steel container which when used on the lead-acid battery will be eaten through. The battery first invented was the nickel-iron alkaline battery. Both Thomas Edison and a Swedish firm made the battery first. But this battery gave trouble and so both the producers stopped production. The Swedish firm used cadmium instead of iron. Cadmium is a soft, grey metal obtained, chiefly as a by-product of the distillation of zinc.

After finding a battery superior in many ways to all other batteries on the market, many firms began to produce the battery in large quantities. The battery became popular in motor cycles because it stood up under heavy vibrations. A cadmium battery installed in a Diesel rail car in Sweden in 1913 was in use after starting the engine 300,000 times !! An American put one in his car and had run 40,000 miles without adding water. It was also reported that the batteries that were used on buses and trains were as good as new even after 15 years of their installation. To-day the prospectful battery is being turned out into many sizes ranging from a tiny model for a hearing aid to a giant multiple unit for Diesel locomotives.

Still in the laboratory stage, it is completely a new type which when finally ready for production is expected to replace one of the most troublesome parts of the present-day automobiles.

One other advantage is that cadium-nickel battery is crashproof. It is also capable of withstanding without injury severe vibrations, shock, short-circuits and standing idle for long periods in any condition of charge or discharge. The plates do not buckle and the active material does not drop from the plates. There are also tiny cadmium batteries for flash-lights and protable radios, as well as for hearing instruments.

A cadmium battery would have replaced completely all other batteries but for the fact that the lead-acid battery and dry battery are cheaper and are satisfactory for many jobs.

Konarka, the Glory of Utkal

GHANASHYAM ACHARYA, *I Year, L. A. E.*

Once Lord Krishna cursed his son Shamba to suffer from Leprosy for some reason. So Shamba, coming to Chandrabhaga, pleased Sun (the divine doctor for Leprosy) by his meditation and was soon cured by his grace. In order to establish the greatness of the Sun, Shambha worshipped the image of the Sun and from that time onwards the holy place of his meditation became well known for the devotees of the Sun. The ancient name of Chandrabhaga was " Maitreyavana " as stated in " Kapila Sanhita " and " Shambapurana ". As the time rolled on the name of 'Maitreyavana' spread out. In the seventh century Purandara Keshari, the then king of Orissa, built a temple and made special arrangements for pujah. The river ' Chandrabhaga ' was then named 'Chitrotpala'. The port, Charitrya which was mentioned by the Chinese traveller to India "Huansiang" was nothing but the now "Konarka". The port Konagara of Ptolemy, the famons Greek writer is also nothing but Konarka. Who can say that once Konarka was the capital of the ancient Utkal, having seen its present wretched condition ?

In the 12th century, Langula Narasingh Dev, the then king of Orissa thought of building a world famous temple for the Sun as the old temples had already been broken. His Chief Minister, Sadashiva Shamant Roy was given the charge. All the well-known carpenters of Utkal were invited to carry out the king's order. The foundation stone was laid in 1225 A.D. and the work ended in 1240. 1200 carpenters were employed in the work continuously for 16 years. At last the construction of the temple came to an end. Artists were relieved and the king heaved a deep sigh. Everything ended happily ; but one thing left a thick line in the bossom of the age. Bishi Maharana, the head of the artists had left his wife while she was pregnant. In due time she gave birth to a child and he was named "Dharmapada" indicating his father's absence for the sake of "Dharmaraja". The boy gradually came to know his professional business and

read thoroughly all the books his father possessed and obtained good knowledge. In those days there was no good communication system in India. So both the father and the son did not know each other. In 1240 Dharmapada left for Konarka to meet his father. But that meeting was their first and the last one. Comedy turned into tragedy !

The king Narasingh Dev ordered that all 1200 men would be put to death if they did not finish the construction of the temple within a fixed time. It was the last evening of the fixed time, when Dharmapada went to meet his father. He came to know everything from his father regarding the construction of the temple. It was the dead of that sadful night that Dharmapada climbed up the temple unknown and unseen and finished the work. The artists were very much afraid for the fact that the king might get angry for their inability to finish the work within the fixed time. Dharmapada decided to solve the problem by putting an end to his life. There was only a few minutes to sun rise. The eastern sky was pale red. The shades of the night were bidding farewell to the earth. He climbed up the temple and jumped into the sea with the holy name of "Surya" in his lips. The sea received him warmly in her lap as if chanting the opening song.

Here may arise a question whether a tender lad of 16 would be able to perform such a work which 1200 well-known artists were tired of doing. But "sometimes even master minds may puzzle in trifling matters" will give a suitable answer. A similar case is the winning of National Championship in tennis by Sri Krishnan. The material body of Dharmapada had been destroyed. But he is still alive in thousands of hearts.

The total money spent on this was very nearly Rs. 40,00,00,000 (forty crores of rupees) which was 12 years' income of the Utkal Govt. of that time. The height of the main temple was 230 feet, the highest temple of the world, and the height of Mukhasala (the temple in front of the main one) was 150 feet. But now the main temple is no more in existence. 20 feet from the top of the front temple has also been destroyed. But still the remaining portion is higher than Bhubaneshwara temple.

The main temple and the Mukhasala is built over a strong foundation of stones of 17 feet height. In Mukhasala, there are three entrances to the main temple in the east, west and south. In the east step, there were seven horses on both sides and at the back of the north step two cavalry horses and at the back of the south step two great elephants of the same nature, and each of them were made up of a single piece of stone weighing many maunds (one maund is equal to 82·28 lbs.). Now the elephants and the horses have been displaced.

The temple was made in the form of the chariot of the Sun. In the foundation there were 24 wheels and in front of it towards the east there were seven horses. The main temple and the Mukhasala were built over it to resemble the chariot of the Sun. The Aruna Sthamba which is now seen in front of Jagannath temple was in front of Konarka temple and it was displaced to Puri during the reign of the Marathas. A man standing at this part will be able to see the Lord Jagannath distinctly. A Natya Mandir was built in the same level at the front of the Mukhasala. Besides this temple

there were a number of other temples also. Now the ruined portion of all these can be seen there. The area of the compound was 11 acres.

Not only in Orissa or India but in the whole world Konarka is undoubtedly famous for its architecture, largeness, spirituality and unblamed fine sculpture and these are the chief objects of Utkal architecture. The word Utkal itself means improved arts. (Ut = improved, Kal = Arts). Konarka is the combination of all the above three descriptions whereas Bhubaneshwar and Puri temples are famous for their fineness and spiritual developments only.

Anyone's heart will be filled with great mirth and delight having beheld Konarka. What a wonderful and amazing work it is! There is no single stone on which nothing has been carved. The carved creepers are not inferior to that of jewellery. Now in this scientific and atomic age, buildings are constructed after micro-calculation. But in those days there were no cement and other things. All these have been made of only stone and instruments used were chiefly chisel, hammer and those were made in our own country. No foreign tools were used and even at that time the world was so to say in darkness. Now the great historians and the critics of world opine that the images of elephants and lions of Konarka will be regarded as the chief wealth in any modern country. Almost all of the statues seem as if all are alive and newly made. 700 years have rolled on. But there is no single disorderliness or decay in the statues. Konarka indicates the relationship between the Sun and lotus flower, for there are many works of lotus flower in it and the another name of the sacred place is "Padma Kshetra".

The sculpture of Konarka is greatly admired. Some pieces of stone of Konarka are just like mountains. The most amazing thing in Konarka is its "Nabagraha-murthi" (the nine stars of human fate). These are carved on a single piece of stone 20′ x 5′ x 4′ weighing 740 maunds. The British Government have tried to take this to the Calcutta Museum, but even after strenuous efforts to remove it to the sea (so that they can easily carry it to Calcutta) they were not able to do it. So $\frac{2}{3}$ of the block from both sides were cut; still it was not carried far away and it now can be seen near the temple.

Another attraction is its Gaja-singh Murthi (the elephant and lion). It was placed at a height of 170′ and weighs 130 maunds. The "Kalasam" which was kept at the top of the temple was 56000 maunds in weight and was kept at a height of 200′. Even in these days of machines, it was found very difficult to carry away the Nabagraha and so it is really very wonderful to us how they were able to carry these heavy stones from outside Orissa (from Nilgris) and to keep in proper position. Konarka also indicates India's advance in steel industry in the ancient times. When the whole world was once unaware of steel industry, India was able to make Delhi Ashoka pillar and the steel plates which were used in temples of Konarka and Bhubaneshwar. Centuries have passed but still the steels are remaining rustless. The greatest advance of Orissa in architecture is Konarka.

For the destruction of Konarka, different men opine differently. Some say

it is destroyed by eathquake while some others say it is due to thunder shock and still others say it is due to gradual fall of foundation. But one of the real reasons is the attack of "Kalapahara" the semi-Mohammadan (so to say), for he broke the Kalasam. Then, Lord Surya and "Aruna Sthambha" were brought to Puri.

There are many festivals in Konarka such as car festival and "Chandra Bhaga Snanam". The latter is being observed even now.

Thousands of pilgrims from all parts of India gather there on the "Maha Saptami" or Makara Sapatami, the next Saptami to "Sri Panchami". The glorious Sun of Konarka has disappeared from days of yore; but the dilapidated portion. is still peeping out from the western horizon of the gloomy sky of Orissa, indicating the greatness of Narasingh Dev, the Samudra Gupta of Utkal.

(The figrues given in this article are taken from the "Orissa Ithihas" by Sri Kripa Sindhu Misra.)

Fast = Charging of Batteries

S. SOMESWARA SARMA, *II Year L. A. E.*

In modern days it has become necessary and hence popular to give a "Fast charging" to the batteries owing to the increasing complexity of electrical equipment and the tendency to omit starting handle. Battery manufacturers agree to the use of batteries subject to certain limitations.

One of the main things to note while fast-charging batteries is to limit the number of fast-charges given to any battery. Due to gassing at the plates towards the end of the charging, rapid charging even under the most suitable conditions tends to cause increased wear and tear of plates. We do not find any noticeable effect in the life of battery if the fast charging is limited to half a dozen times during the life of a battery.

Fast-charging should be stopped before excessive temperature rise takes place. Even a healthy battery is bound to get damaged on a single fast-charging, if this fast-charging is kept for too long a time. This is mainly because of the undue temperature rise in the battery and partly due to wear on plates, caused by gassing. Hence an automatic means of limiting the length of charge is necessary. That is we should find a device by which we can cut down the charge when the temperature reaches a predetermined figure preferably not higher than 125°F. This device may be in the form of a thermostat fitted with one cell. A most important precaution should be taken to see that the thermostat fits properly in the cell vent and must be immersed in the electolyte and the latter is more important.

An alternative method is to provide the charger with a time switch already set to the proper position according to the state of discharge of the battery as determined by the readings taken with a hydrometer and a high rate discharge tester.

Much difficulty does not arise in choosing between the two methods. Thermostat has the advantage of being

based directly upon the battery temperature, but this may mean that the battery is gassed for a longer period than actually necessary. The time switch system, unless intelligently supervised, may mean that the battery reaches an excessive temperature before the switch operates. In the absence of a thermostat it is desirable to check the rise while the fast charging is in progress. A further useful check is to see that the battery voltage does not rise above 8·5 volts in a 6 volts battery.

Fast charging must be restricted to run down batteries which are in healthy condition; otherwise, if the battery is sluggish and sulphated particularly if it has been standing in an overdischarged condition for a lengthy period, it can only be recovered by a long slow recharge. Such a battery on fast-charge would gas violently from the commencement and would show a very rapid rise in temperature. Similar remarks apply to a battery in which the upper portions of the plates are sulphated as a result of standing for a long period with a low level of electrolyte.

The condition of cells must therefore be checked before hand with a hydrometer and a high rate discharge tester. If all the cells show practically zero readings, the battery is unsuitable for fastcharging. The provision of a thermostat does afford a partial safeguard against the overheating of a sluggish or sulphated battery. But it does not entirely obviate the risk of damage and a preliminary check on the condition of the cells is still necessary.

Fast-charges are definitely unsuitable for giving initial charges to new batteries. Any attempt to do so would result in permanent damage against which no system of control affords safeguard. It is essential that the initial charges should be given at a slow rate over a long period in accordance with the instructions issued by the maker.

Arc Welding

M. L. RANGARAJAN, *I Year L. A. E.*

The art of joining metal is one of the oldest arts known to man. Ever since the first cave dweller or half monkey man hammered his piece of iron or copper between two stones, the development of this art has gone forward, and will probably continue to develop as long as men use metals. The welding of the iron is apparently as old as the production of that metal by man, for there is, in a temple yard of ancient city of Delhi, an iron pillar nearly two thousand years old, which shows unmistakable evidence of having been welded.

Strictly speaking, "Welding" is the uniting or joining of two pieces of metal by hammering them together while they are hot enough. But modern methods of obtaining high temperatures by gases and electricity have made possible the development of other and better methods of joining metals.

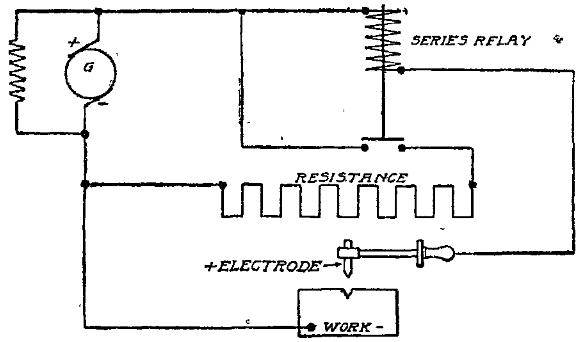
The process of welding with electric arc is possible with nothing more than a source of current at a suitable voltage. In order to weld with arc it is necessary first to connect the work to the positive side of the power supply, and the

electrodes to the negative side of the circuit, by means of wires and cables. The negative electrode should then be placed in contact with the work and quickly with-drawn, thus establishing the arc, which provides the necessary temperature. As the metal soon begins to melt the work may be begun at once.

The equipments required for electric arc welding largely depends upon the nature of the work to be done, but of course, the most complete apparatus does the best work, as in the case of any other sort of apparatus. The most elementary equipment consists of a barrel of water with two iron plates in it and an electrode holder, with some cables to connect the parts to the power circuit.

General electric arc welder: This equipment consists of a compound-wound low-voltage direct current generator, direct coupled to a motor to suit the power supply or an internal combustion engine together with a switch board containing the necessary devices for controlling the machine and welding circuits.

The wiring diagram for general electric welding system is shown in fig. It will be seen that the current flows from the positive to the work through a bank of resistance grids.



Several men can work at once from machines of this type because of the constant voltage of the system, by adding enough circuits controlling relays and contractors.

There are some other systems of electrical welding which are known as Siemund-Wenzel welding system, C and C electrical Arc welding system, Burke electric welding system, quasi-arc welding system and so on. In all these methods of welding the principle is the same, but the voltage and current, the consumption of electrical energy and some other factors will vary.

Welding operations are of various kinds and take different values of current, depending upon the nature of the material worked up on, the size and sort of operation to be performed. For example, thin steel sheets require less current than thick ones. As a general rule it may be said that the metallic welding operations usually require from 50 to 150 amperes although thin sheets may be welded with as little as 15 amperes and extra heavy ones may take 185 or 190 amperes.

The rate at which welding can be done depends upon the article to be welded, its size and shape, material, nature of weld etc.

The strength of the weld can be made equal to that of the articles, welded by reinforcing. In order to test the relative strengths of riveted, electric arc welded, and acetylene welded joints, a set of steel samples can be made up and tested with suitable equipments.

The cost of the arc welding will vary according to the nature of the work, the skill of the operator, and the cost of labour and current, but it is much less than the cost for similar work done by

any other process. It ranges from about three fourths down to one-tenth the cost of acetylene welding, for various jobs, and the time required is much less.

In conclusion, it should be remembered that in order to weld with arc it will require some practice in starting the arc, especially with the metallic electrode. The trick consists in touching the work and getting away as quickly as possible to the required distance, and yet not going so far as to rupture the arc. Care should be excercised to see that the eyes and face are fully protected from the glare and heat of arc, as it is hard on the eyes and affects the skin, like bad sunburn. On the other hand some men have done arc welding for years without any injury.

Gold

V. SUBRAMANIAM, *I Year, L.A.E.*

Introduction : No sooner do we think about gold than automatically the fine yellow colour and brilliant appearance of the metal comes before our eyes. It is known to each and everybody that it is a valuable thing and it is found in Mexico, China, Japan, Ceylon and in India at Kolar. It is in great demand for women particularly to adorn them as ornaments such as bangles, chains, rings, etc. When compared to other metals it is comparitively soft. In India every year gold ores are dug out which are worth about a number of crores. In India there is also a mine in Oorgam; Next we shall pass on to the properties of the metal.

Properties of Gold : It is the most malliable and ductile among metals. A grain of it can be drawn into 500′ long wire. Its tenacity is about 7 tons per sq. in. The impurities in this metal are lead, bismouth, antimony and arsenic. It has a melting point of about 1064°C. It contracts considerably on solidifying. Its specific gravity is 19·3. This metal is unaffected by dry or moist air and resists the action of acids. When nitric acid is mixed with HCl in the ratio of 1 : 3 is called Aqua Regia which alone dissolves gold. Mercury readily amalgamates with gold.

Occurance : Gold occurs naturally in the free state but to some extent also as telluride and possibly as sulphide. The gold occurs in all degrees of coarseness from microscopic particles to considerable size. These are known as "neggets". The Mailand bar from New South Wales exhibited at the mining Exhibition of 1890 contained 313.093 ozs. of fine gold. Gold is very widely distributed in small quantities. South African and Australian mines are the richest mines in the world.

Hydraulic Mining : We know that the ores of gold are mixed in very small proportions in the river sand. But would it be a profitable proposition to extract the metal from that one? Certainly not. Gold is extracted from its ores in two ways viz., (1) Hydraulic mining and (2) Cynide process. During the course of the hydraulic mining a powerful jet of water is directed against the bank by means of iron nozzle to dislodge the

auriferous gravel. The quantity of water required is sometimes carried from miles, through pipes and is delivered at high pressures. The dislodged material is carried by the stream of water down a series of long wooden troughs–the troughs made in 12′ lengths fitted together which have slope of about an inch to the foot, more or less. The bottoms of these are closed at intervals by wooden or iron bars, rifles, behind which the heavy particles of gold have a greater tendency to settle or lodge. Current carries the lighter gravel. Perforated iron bars or grizzlys are introduced at intervals in the bottom of troughs. Mercury is fed in small quantities from time to time at the top of the troughs. It lodges behind the rifles and catches the particles of gold. Amalgamated copper plates are often suspended into the troughs to catch the floating gold. The amalgam is removed at intervals. At the upper part of the troughs the greater part of the gold is being caught. Thus gold is removed from its ores by hydraulic mining.

Cynide Process: The other way by which gold is extracted from its ores is the cynide process which was introduced by M/s. MacArthur and Forrest. This process depends upon the well known fact that pottasium cynide attacks gold in the presence of oxygen and if in a fine state of division rapidly dissolves it. The raw pulp may be treated directly which has a great advantage in this process, no concentration by washing being necessary. The ground material is left in contact with the solution for a period of 60 to 72 hours. The clear solution is brought into contact with the zinc shavings or zinc powder to precipitate the gold or passed through electolytic cells to deposit gold. The gold is precipitated by the zinc as a black powder. It is collected periodically and melted with fluxes in crusibles.

Refractory Ores: These may be treated directly or undergo a preliminary calcination. The latter method yields better extraction. In one case, the ore yielding 80% by direct treatment, yielded 90% of its gold, after calcining. In any case, the ore is ground to slime and agitated with a cynide solution.

Recovery of Gold: (1) By passing it boxes containing metalic zinc in through fine shavings. (2) By agitating the solution with zinc powder and filtering of the precipitated gold in a filter press. (3) By electrolytic methods. The first method is generally employed.

Alloys: The common method of expressing the quality of gold alloys is in carats and the carat grains. Pure gold is 24 carat fine. English coinage gold is 22 carats. The alloy is copper. Silver and copper are usually alloyed for the purpose of hardening gold, when malliability is required for purposes of working. Zinc is some times added when rigidity and hardness are most important.

Our Association

—:o:—

The objects of our Association are :—

(1) To foster a spirit of brotherhood among all the members.

(2) To diffuse among its members information on all matters regarding Engineering.

(3) To enrich and enhance their knowledge in Engineering as well as in Literary fields by arranging periodical lectures, discussions and debates.

(4) To arrange Excursions of Engineering value.

—:o:—

10-7-'53 A General body meeting was conducted to elect the office bearers for the current Academic year. The following were elected as the office bearers.

Ex-officio President:	Sri S. Jagannathan, L.A.E. (Principal)
President:	Mr. S. Prasada Rao, III Year L.A.E.
Vice-President:	Mr. P. S. Venkataraman, I Year L.A.E.
Secretary:	Mr. S. Someswara Sarma, II Year L.A.E.
Asst. Secretary & Treasurer:	K. Sankaranarayanan, II Year L.A.E.
Editor:	P. N. Krishnan, II Year L.A.E,
Sub-Editors:	G. N. Satagopan, II Year L.A.E.
	C. Venkatasubbiah, I Year L.A.E.
Representatives:	I Year: G. Venkataraman.
	II Year: T. K. Chandrasekaran.
	III Year: S. Sanjeeva Rao.

15-7-'53 — A General Body meeting was conducted to decide the membership and magazine fees. As. 12/- and As. 4/- were fixed as membership and Magazine fees respectively. On the same day, the House was pleased to relieve Mr. S. Prasada Rao from his Presidentship. Mr. G. Jagadeesan, III Year L.A.E. was elected in his place.

28-7-'53 — The inaugural address was delivered by Prof. Oscar Sholes, Professor In Charge of I.C. engineering, Madras Institute of Technology. Dr. H. A. Haveman of I.C. Engineering department, Indian Institute of Science, Bangalore, also spoke. Hon'ble Dr. U. Krishna Rao, Minister for Industries and Transport, Government of Madras, presided.

13-8-'53 — Messrs. Burmah-Shell Oil Co. kindly screened the following films.

1. Birth of an Oil field.
2. First principles of petrol Engines.
3. The Diesel story.
4. Lubrication of petrol Engines.

15-8-'53 — Independence day was celebrated. Swami Nisreyasananda, Rector, Vivekananda College, addressed the gathering. Hon'ble. Justice P. Satyanaryana Rao of Madras High Court hoisted the national flag and presided over the function,

18-8-'53 — The final year students were taken to M/s Lucas India Ltd. to observe the fuel injection equipment repairs.

20-8-'53 — United States Information Services kindly screened the following films.

1. Herald Tribune Youth Forum.
2. Ball Bearings in the modern world.

25-8-'53 — I and II Year students were taken to Messrs. Oldham & Son to observe the Battery Manufacturing.

27-8-'53 — The final year students were taken to Messrs. Ashok Motors to observe the assembling of motor car parts.

14-9-'53 — Mr. J. C. Vedamuthu, B. E. (Works Manager of M/s Oldham & Son, Madras,) spoke on "Battery manufacturing in India." The student president presided.

24-9-'53 — British Information Services kindly screened the following films.

1. Local Handyman.
2. Power Lines.
3. Gardens of England.

4-10-'53 — II and final Year students visited the Southern Railway Workshop at Perambur.

28-10-'53 — A general body meeting was conducted to accept the resignation of Mr. P. N. Krishnan, the Editor. Mr. K. Umamaheswara Rao and Mr. M. Srinivasan of Final Year were elected as Joint-Editors.

2-11-'53 — The II and Final Year students visited Messrs. Simpson & Co., to observe Perkins Diesel Engine assembly and general machine-shop.

19-11-'53 — The II Year students visited Messrs. India Pistons to observe the Piston and Piston ring manufacturing.

25-11-'53 — An Elocutional meeting was conducted. The following spoke on the subjects indicated against their names :

Mr. S. Prasada Rao	...	Plastics
Mr. T. K. Chandrasekaran	...	Smithy
Mr. N. Mahadeva Iyer	...	Motor Accidents
Mr. K. Sankaranarayanan	...	Moleculer Theory of Magnetism
Mr. P. Mallikarjuna Chetty	...	Iron
Mr. V Subramanian	...	Gold

The Vice-President of the Association presided.

26-11-'53 — British Information Services kindly screened the following :

1. Co-operative Resesearch in Industries.
2. Transmission of rotary motion.
3. Brabazon.
4. Queen's Coronation day.

7-12-'53 — United States Information Services kindly screend the following films :

1. University of Los Angeles.
2. Foreign Sports in U. S.
3. IKE-the 34th President of U. S.

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21-1-'54 — Lietc. (E) V. S. P. Mudaliar, L.A.E., A.F.R., Ac.S., (an old student) Technical Adviser, I.N.S., Cochin, spoke on "Modern developments in Aircraft Engineering". The student president presided.

22-1-'54 — British Information Services kindly screened the following films :

1. Furnace in Practice.
2. Boiler House Practice.

23-1-'54 — The final year students visited Messrs. Sundaram Motors to observe the wheel alignment gauge in operation.

25-1-'54 — All the students were taken to Park Fair and Exhibition to see Mr. G. D. Naidu's works on Automobiles.

29-1-'54 — The final year students visited the Standard Motor Products of India Ltd., Vandalur. On the way back, they also visited The Government Coach Building Factory, Chromepet.

2-2-'54 — British Information Services kindly screened the following films :

1. Moving millions.
2. The Steam Engine.
3. How a bicycle is made.

6-2-'54 — An elocutional meeting was conducted. The following spoke on the subjects indicated against their names :

1. T. R. Ramakrishnan ... Diesal Engines
2. S. Balasubramanian ... Tech. Education in India.
3. S. Someswara Sarma ... Induction and Electricity.
4. S. Soundappan ... Types of Automobile Engines.
5. C. Krishnamoorthy Rao ... Armature winding.

I wish to avail myself of this opportunity to acknowledge with thanks the valuable and beneficial services rendered by the United States Information Services and Messrs. Burmah-Shell Oil Co. by way of showing films free of charge. It now behoves me to give an expression to my feelings of gratitude to all the distinguished guests who addressed the members on topics of Engineering interest. While writing these reminiscences, I cannot help recalling with thankfulness and pleasure the ardent and sincere efforts and unceasing kindness of all the members of the staff and Association. Lastly my sincere thanks are due in no small measure to Sri S. Jagannathan, Principal of our Institute for his unceasing kindness and guidance in the activities of our Association. We hope that the activities of the Association in future will be carried on like the "Shining Light that shineth more and more unto the perfect day."

We hope to achieve ranks with those who are already in position.

Thanking you all and wishing you the best.

JAI HIND

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Secretary

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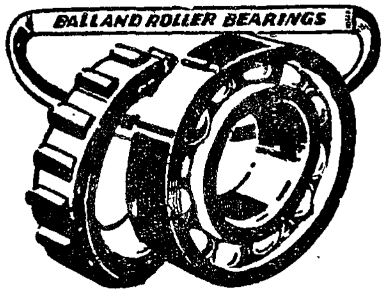

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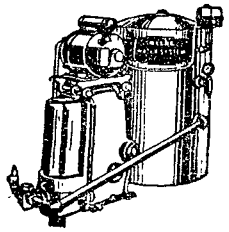

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Printed By Sri C. Krishnamurthi, at the Sri Ramakrishna Printing Works, 19-B Woods Road, Mount Road, Madras 2. Edited and Published by by Mr. S. Jagannathan L. A. E. at the Ramakrishna Mission Technical Institute, Mylapore, Madras 4.